Techniques for effective searching with IEEE Xplore

Eszter Lukács

Client Services Manager Europe

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IEEE

1884: Where we came from

About the IEEE

- World's largest technical membership association with more than 430,000 members in over 160 countries
- Not for profit organization "Advancing Technology For Humanity"
- Four Core areas of activity
  - Membership organization
  - Conferences organizer
  - Standards developer
  - Publisher of journals, conferences, standards, ebooks and elearning
- IEEE *Xplore* by the numbers:
  - Nearly 4 million total documents
  - Over 3 million unique users
  - More than 8 million downloads per month
  - 15 year anniversary in 2015!

IEEE student volunteers in Mumbai

IEEE Day Contest Winner, Colombia

IEEE

Career Development Resources and Opportunities for student members

IEEE Job Sites and Career Alerts

- Locate career opportunities easily and confidentially
- Weekly email newsletter containing career advice

IEEE Xplore

- Learn to use IEEE Xplore for company, career, and job related searches

Awards, Fellowships & Scholarships

- Recognizes the accomplishments of IEEE members
- Enhance your resume with an IEEE award

Conferences

- Networking and Presenting Opportunities
- Student Paper Contests

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Teams registered in 2013:

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IEEE

Why you should rely on IEEE information

IEEE quality makes an impact

Thomson Reuters Journal Citation Reports® by Impact Factor

IEEE publishes:

- **17 of the top 20** journals in Electrical and Electronic Engineering
- **14 of the top 15** journals in Telecommunications
- **3 of the top 5** journals in Computer Science, Hardware & Architecture
- **3 of the top 5** journals in Computer Science, Cybernetics
- **3 of the top 5** journals in Automation & Control Systems
- **3 of the top 5** journals in Artificial Intelligence
- **2 of the top 5** journals in Imaging Science & Photographic Technology

The Thomson Reuters Journal Citation Reports presents quantifiable statistical data that provides a systematic, objective way to evaluate the world's leading journals.

Based on the 2015 study released June 2016

More info: www.ieee.org/citations

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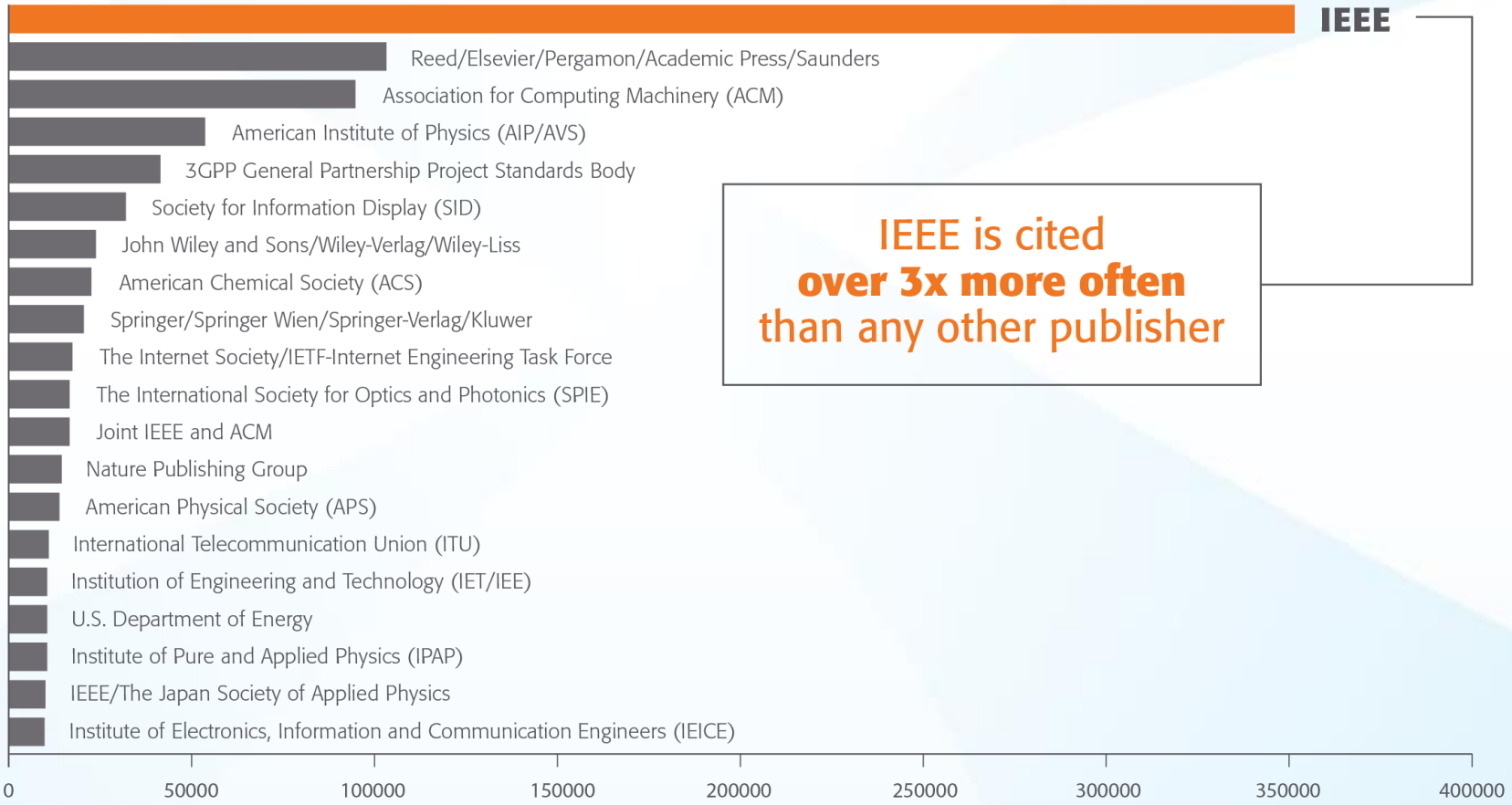
- 1500+ annual **IEEE conferences** + 43 **VDE conferences**
- More than **2800 IEEE standards** (active, archived. redlines) + **IEEE Standard Dictionary**
- 20 **IET conferences**, 26 **IET journals & magazines**
- **Bell Labs Technical Journal** (BLTJ) back to 1922
- Backfile to 1988, select legacy data back to 1872
- Inspec index records for all articles

IEEE and Patents

IEEE Leads US Patent Citations

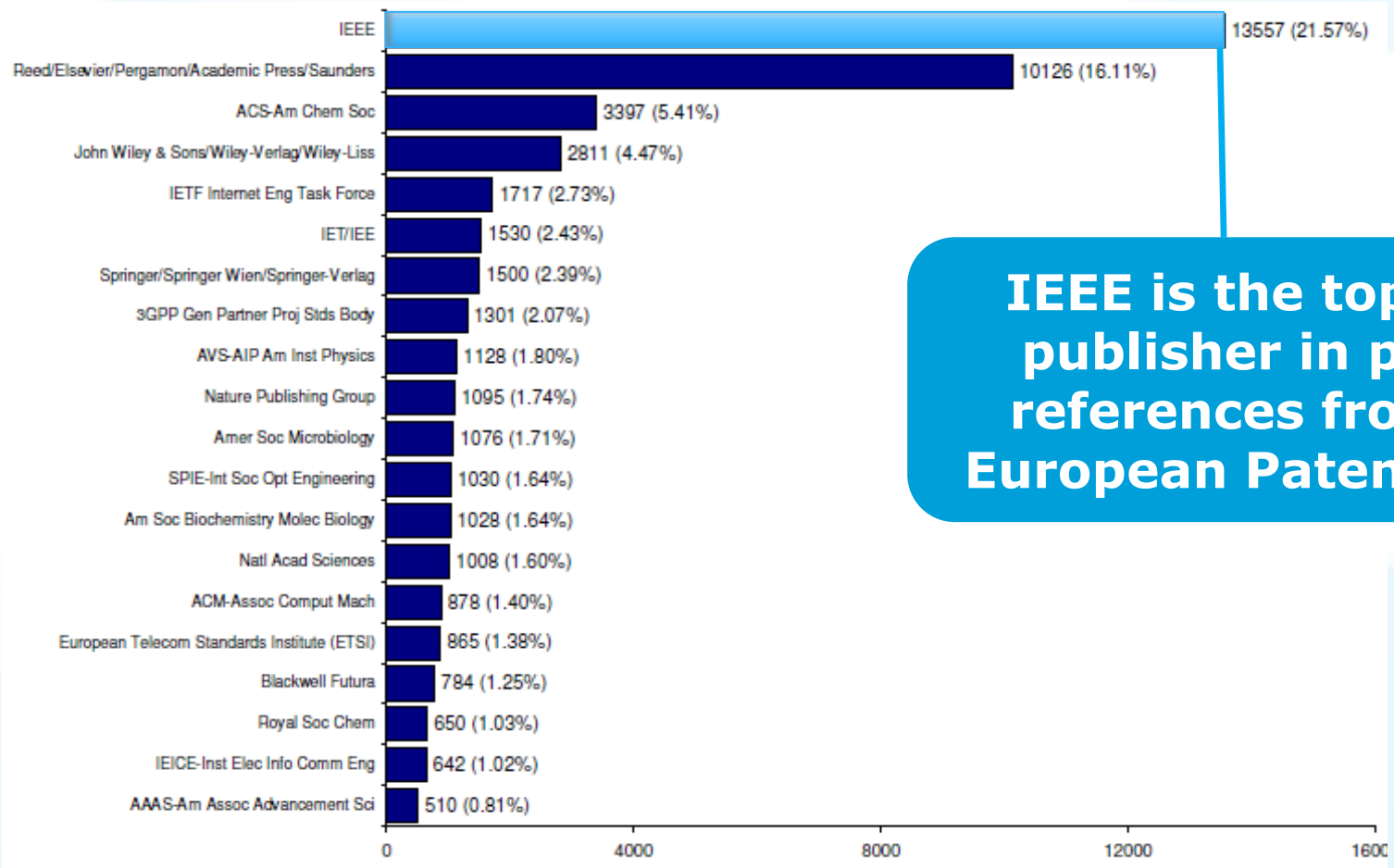
Top 20 Publishers Referenced Most Frequently by Top 40 Patenting Organizations



Source: 1790 Analytics LLC 2015. Based on number of references to papers/standards/conferences from 1997-2014

IEEE Leads European Patent Citations

Top 20 Publishers Referenced Most Frequently by Top 25 Patenting Organizations



IEEE is the top cited publisher in patent references from the European Patent Office

Source: 1790 Analytics LLC 2012, , Science References from 1997-2011

IEEE

Technology areas where patents cite IEEE most

Battery	Computer hardware	Computer software
Information storage	Measuring, testing, and control	Medical devices
Nuclear and X-ray	Optics	Power systems
Robotics	Semiconductors	Smart Grid
Solar/Photovoltaic	Telecommunications	Wind Energy

Source: 1790 Analytics LLC 2015

IEEE

Content on IEEE Xplore Digital Library

Full text content from all 39 IEEE Societies

- IEEE Aerospace and Electronic Systems Society
- IEEE Antennas and Propagation Society
- IEEE Broadcast Technology Society
- IEEE Circuits and Systems Society
- IEEE Communications Society
- IEEE Components, Packaging, and Manufacturing Technology Society
- IEEE Computational Intelligence Society
- IEEE Computer Society
- IEEE Consumer Electronics Society
- IEEE Control Systems Society
- IEEE Dielectrics and Electrical Insulation Society
- IEEE Education Society
- IEEE Electron Devices Society
- IEEE Electromagnetic Compatibility Society
- IEEE Engineering in Medicine and Biology Society
- IEEE Geoscience and Remote Sensing Society
- IEEE Industrial Electronics Society
- IEEE Industry Applications Society
- IEEE Information Theory Society
- IEEE Instrumentation and Measurement Society
- IEEE Intelligent Transportation Systems Society
- IEEE Magnetics Society
- IEEE Microwave Theory and Techniques Society
- IEEE Nuclear and Plasma Sciences Society
- IEEE Oceanic Engineering Society
- IEEE Photonics Society
- IEEE Power Electronics Society
- IEEE Power & Energy Society
- IEEE Product Safety Engineering Society
- IEEE Professional Communications Society
- IEEE Reliability Society
- IEEE Robotics and Automation Society
- IEEE Signal Processing Society
- IEEE Society on Social Implications of Technology
- IEEE Solid-State Circuits Society
- IEEE Systems, Man, and Cybernetics Society
- IEEE Technology and Engineering Management Society NEW in 2015
- IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society
- IEEE Vehicular Technology Society

IEEE

IEEE covers all areas of technology

More than just electrical engineering & computer science

MACHINE LEARNING

BIG DATA

OPTICS

RENEWABLE ENERGY

SEMICONDUCTORS

SMART GRID

IMAGING

NANOTECHNOLOGY

SIGNAL PROCESSING

AEROSPACE

COMMUNICATIONS

HUMAN-CENTERED INFORMATICS

BIOMEDICAL ENGINEERING

ELECTRONICS

NEXT GEN WIRELESS

CIRCUITS

CLOUD COMPUTING

CYBER SECURITY

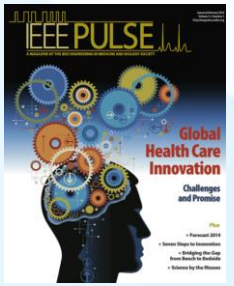
ELECTROMAGNETICS

IEEE

Multidisciplinary Content on IEEE Xplore Digital Library

Life Sciences

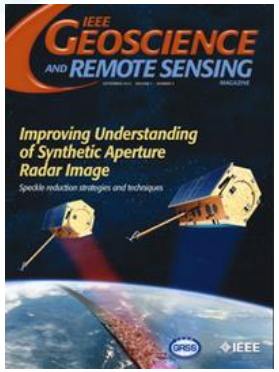
- At least **eight IEEE publications are dedicated in whole or in part to technology related to Life Sciences**.
- Plus, there are more than 90 annual conferences, 20 periodicals and 20 IEEE standards that cover **medical device communications.**
- In IEEE *Xplore*, you'll also find coverage of therapeutic devices used in rehabilitation processes, such as physical therapy and devices used to restore movement and function.
- Examples of IEEE publications:
  - **IEEE Pulse**
  - **IEEE Trans. on Biomedical Engineering**
  - **IEEE Reviews on Biomedical Engineering**
  - **IEEE Trans. on Neural Systems and Rehabilitation Engineering**
  - **IEEE Trans. on Information Technology in Biomedicine**
  - **IEEE Trans. on Medical Imaging**
  - **IEEE/ACM Trans. on Computational Biology and Bioinformatics**
  - **IEEE Trans. on Biomedical Circuits and Systems**
  - **IEEE Trans. on NanoBioscience**
  - **IEEE Trans. on Autonomous Mental Development.**



IEEE

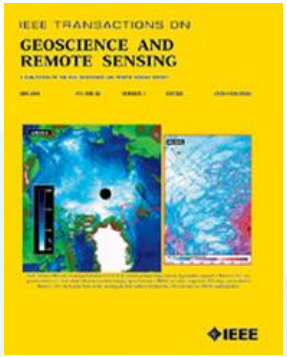
Geoscience and related fields

- IEEE's geoscience and remote sensing publications cover the fusion of engineering and **geoscientific fields including geophysics, geology, hydrology, meteorology, etc.**



- In IEEE *Xplore*, you'll also find information relevant to **natural resources engineering** and **mineral resources engineering**, including extensive coverage of technologies related to **oil and gas exploration, drilling operations, offshore oil rigs and mining**.

- Examples of IEEE publications:
  - **IEEE Trans. on Geoscience & Remote Sensing**
  - **IEEE Geoscience & Remote Sensing Magazine**
  - **IEEE Geoscience & Remote Sensing Letters**
  - **IEEE International Symposium Geoscience and Remote Sensing (IGARSS)**
  - **IEEE Petroleum and Chemical Industry Technical Conference (PCIC)**



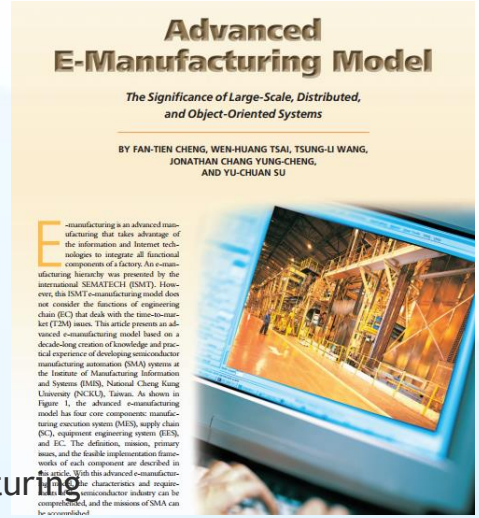
IEEE

Manufacturing Engineering

- IEEE's publications cover manufacturing practices and technologies, including **the development of systems, processes, machines, and tools**.

- In IEEE *Xplore*, you'll find information on **virtual manufacturing, computer integrated manufacturing, agile manufacturing, quality control, robotics and automation, mechatronics**, and much more

- Relevant IEEE publications include:
  - IEEE/ASME Transactions on Mechatronics (#1 most cited journal in Engineering – Manufacturing)
  - IEEE Transactions on Components, Packaging and Manufacturing Technology
  - IEEE Transactions on Semiconductor Manufacturing
  - IEEE Transactions on Automation Science and Engineering
  - IEEE Robotics & Automation Magazine
  - IEEE International Symposium on Assembly and Manufacturing
  - International Conference on Digital Manufacturing and Automation
  - e-Manufacturing & Design Collaboration Symposium Electronics Manufacturing Technology Symposium
  - International Conference on System Science, Engineering Design and Manufacturing Informatization


Advanced
E-Manufacturing Model

The Significance of Large-Scale, Distributed, and Object-Oriented Systems

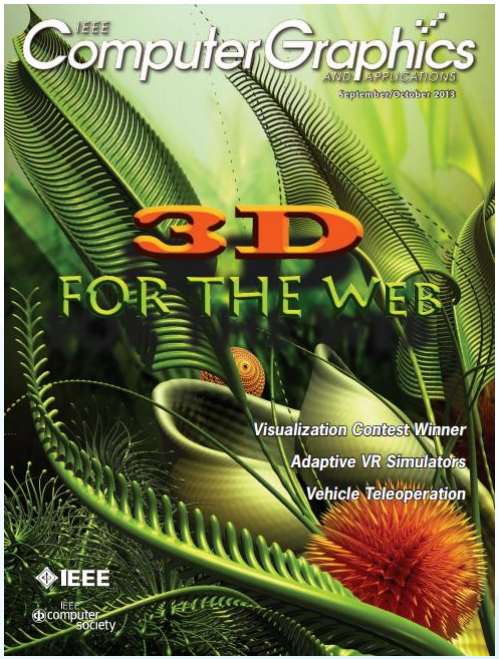
BY FAN-TIEN CHENG, WEN-HUANG TSAI, TSUNG-LI WANG, JONATHAN CHANG YUNG-CHENG, AND YU-CHUAN SU

E-manufacturing is an advanced manufacturing that takes advantage of the information and Internet technologies to integrate all functional components of a factory. An e-manufacturing hierarchy was presented by the international SEMATECH (ISMT). However, this ISMT e-manufacturing model does not consider the functions of engineering chain (EC) that deals with the time-to-market (T2M) issues. This article presents an advanced e-manufacturing model based on a decade-long creation of knowledge and practical experience of developing semiconductor manufacturing automation (SMA) systems at the Institute of Manufacturing Information and Systems (IMIS), National Cheng Kung University (NCKU), Taiwan. As shown in Figure 1, the advanced e-manufacturing model has four core components: manufacturing execution system (MES), supply chain (SC), equipment engineering system (EES), and EC. The definition, mission, primary issues, and the feasible implementation frameworks of each component are described in this article. With this advanced e-manufacturing model, the characteristics and requirements of the semiconductor industry can be comprehended, and the missions of SMA can be accomplished.

IEEE

Digital Art & Technology

- IEEE *Xplore* covers the leading edge of **computer graphics technology and its applications** in everything from business to the arts.
- Topics include **computer graphics, design, animation, 3D, user interface, motion graphics**, and more
- Examples of IEEE *Xplore* publications:
  - IEEE Computer Graphics
  - IEEE Trans. On Visualization & Computer Graphics
  - International Conference on Computer-Aided Design & Computer Graphics
  - International Conference on Computer Graphics, Imaging & Visualization
  - International Conference on Image & Graphics



IEEE

Game Design

- IEEE *Xplore* covers the design of **video games, mathematical games, human-computer interactions in games, and games involving physical objects.**

- Topics include **game production, computational intelligence, artificial intelligence, simulations**, and more

- Examples of IEEE *Xplore* publications:
  - IEEE Trans. On Computational Intelligence and AI in Games
  - Symposium on Computational Intelligence in Games
  - International Conference on Computer Games
  - International Workshop on Digital Game and Intelligent Toy Enhanced Learning
  - International Symposium on Haptic, Audio, Visual Environments and Games

With IEEE *Xplore*, learn how technology impacts fields such as…

Healthcare: telemedicine, electronic medical records, patient-specific healthcare, cloud computing in the medical field, patient monitoring systems, informatics, and more

Emerging Technologies for Patient-Specific Healthcare

I. Introduction

PATIENT-SPECIFIC healthcare is a research field that has recently garnered much more attention due to the benefits of better services provided to patients and a reduction of healthcare costs. A series of emerging technologies [1] aim to emphasize the provision of personalized healthcare services to patients [2]–[5]. These include the following.

1) Pattern recognition methods for signal pattern classification toward the prediction and diagnosis of diseases.
2) Body sensor networks.
3) Algorithms for the analysis of patient-specific physiological signals.
4) Ontologies and context-based electronic health records (EHRs).
5) Methodologies for the integration of clinical, i[illegible], and

intranuclear spike activity recorded from Parkinson's disease patients.

A new Neural Sensing Healthcare System for 3D Vision Technology, NeuroGlasses, is presented in [7]. NeuroGlasses is a nonintrusive, wearable physiological signal monitoring system to facilitate health analysis and diagnosis of 3-D video watchers. The NeuroGlasses system acquires health-related signals by physiological sensors and provides feedback of health-related features. The system employs signal-specific reconstruction and features extraction to compensate the distortion of signals caused by the variation of sensor placement. Through an on-campus pilot study, the experimental results show that NeuroGlasses system can effectively provide physiological information.

In [8], the authors explore how the rhythmogram can be used

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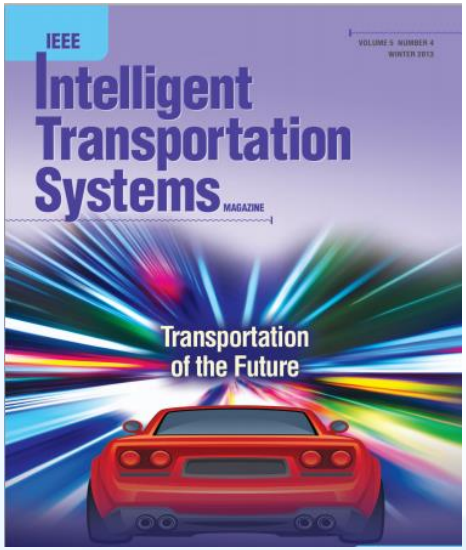
Transportation: intelligent transportation systems, logistics, supply chain management, and more

- Related IEEE Journals & Conferences:
  - IEEE Trans. on Intelligent Transportation Systems
  - IEEE Intelligent Transportation Systems Magazine
  - IEEE Trans. on Automation Science and Engineering
  - IEEE International Conference on Automation and Logistics



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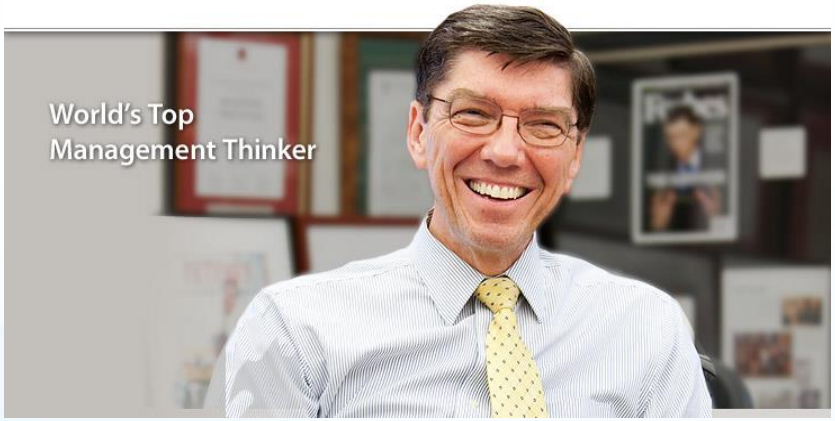
Business & Finance: information systems, project management, risk management, business informatics, R&D project selection and evaluation, IT investment justification, innovation, and more

Read articles by leaders in the field:

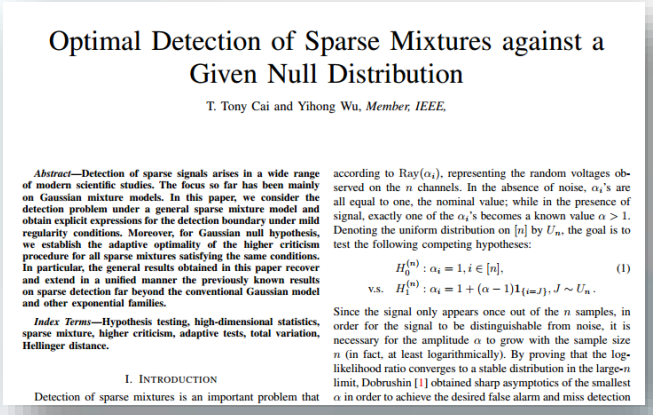


Prof. Clayton Christensen

Harvard Business School

"Innovator's Dilemma"

http://www.claytonchristensen.com/



Optimal Detection of Sparse Mixtures against a Given Null Distribution

T. Tony Cai and Yihong Wu, *Member, IEEE,*

***Abstract*—Detection of sparse signals arises in a wide range of modern scientific studies. The focus so far has been mainly on Gaussian mixture models. In this paper, we consider the detection problem under a general sparse mixture model and obtain explicit expressions for the detection boundary under mild regularity conditions. Moreover, for Gaussian null hypothesis, we establish the adaptive optimality of the higher criticism procedure for all sparse mixtures satisfying the same conditions. In particular, the general results obtained in this paper recover and extend in a unified manner the previously known results on sparse detection far beyond the conventional Gaussian model and other exponential families.**

***Index Terms*—Hypothesis testing, high-dimensional statistics, sparse mixture, higher criticism, adaptive tests, total variation, Hellinger distance.**

I. Introduction

Detection of sparse mixtures is an important problem that

according to $\mathrm{Ray}(\alpha_i)$, representing the random voltages observed on the n channels. In the absence of noise, α_i's are all equal to one, the nominal value; while in the presence of signal, exactly one of the α_i's becomes a known value $\alpha > 1$. Denoting the uniform distribution on $[n]$ by U_n, the goal is to test the following competing hypotheses:

$$H_0^{(n)} : \alpha_i = 1, i \in [n], \quad (1)$$
$$\text{v.s.} \quad H_1^{(n)} : \alpha_i = 1 + (\alpha - 1)\mathbf{1}_{\{i=J\}}, J \sim U_n .$$

Since the signal only appears once out of the n samples, in order for the signal to be distinguishable from noise, it is necessary for the amplitude α to grow with the sample size n (in fact, at least logarithmically). By proving that the log-likelihood ratio converges to a stable distribution in the large-n limit, Dobrushin [1] obtained sharp asymptotics of the smallest α in order to achieve the desired false alarm and miss detection

Prof. Tony Cai

The Wharton School of the University of Pennsylvania

With IEEE *Xplore*, learn how technology impacts fields such as…

Criminal Justice: crime scene investigation technologies, cybercrime, crime statistics, and more

Dimensional Analysis of a Crime Scene from a Single Image

Dimensional
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This paper ap
Written by: G

Crime Forecasting Using Data Mining Techniques

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This paper appe
11-11 Dec. 201

Cybercrime regulation at a cross-road: State and transnational laws versus global laws

The proliferation of cybercrime necessitates all internet-connected states to be involved in cybercrime regulation. Although it has been stated that the internet per se and cyberspace in general are by its very nature ungovernable, many states have taken territorial control of the internet although the effectiveness of such control in cross-border crime commission may be questioned. The internet may very well become ungovernable if a nation-state takes a unilateral decision on which conduct constitutes permissible online conduct or endeavours to superimpose laws on other nation-states. It is therefore suggested that under the auspices of the United Nations and within an international law context the following issues should be addressed: conceptualizing the term "cybercrime" in establishing for example whether it includes a cyber-attack, determining which online conduct is permissible to ensure peace and security and initiating negotiations towards a Cybercrime Treaty.

This paper appears in: Information Society (i-Society), 2012 International Conference on, Issue Date: 25-28 June 2012, Written by: Watney, Murdoch

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Liberal Arts: digital humanities, use of image processing in art conservation, music classification, and more

2012 6th IEEE International Conference on Digital Ecosystems and Technologies (DEST)

TRACK E: DIGITAL HUMANITIES

Track co-Chairs

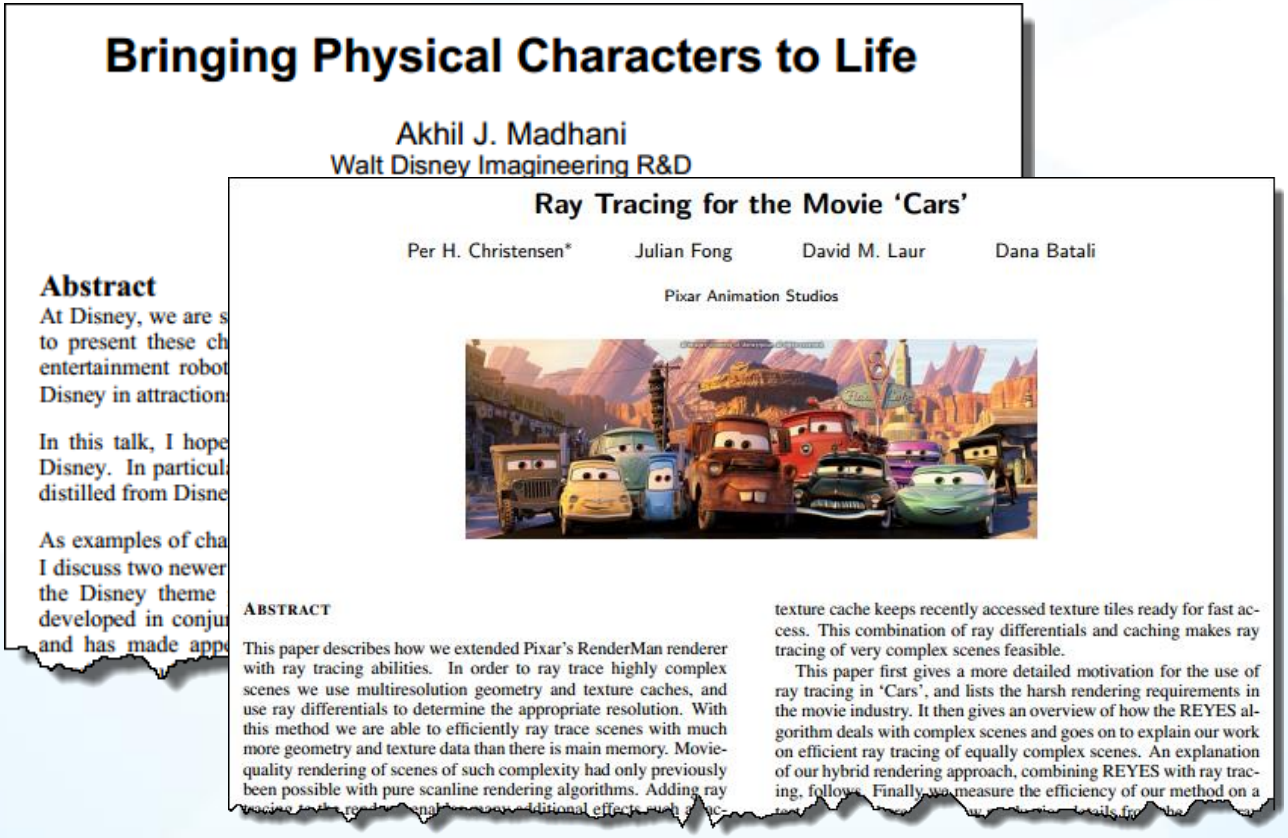
- **Tobias Blanke,** *Kings College, UK*
- **Stuart Dunn,** *King's College London, UK*

The digital humanities form a bridge between the traditional practices of scholarship and the opportunities afforded by advances in technology, enabling researchers to reconsider old problems in new ways, and providing the methods, tools and frameworks to support them in developing new modes of enquiry. On the one hand, the humanities are faced with ever greater volumes of complex data and digital resources, for example from the increasing mass digitisation of historical records.

On the other hand, research in the humanities is moving away from the model of individual scholars to one in which international and inter-disciplinary teams of researchers collaborate actively within a diverse ecosystem of digital resources, tools, and services, not forgetting of course the users themselves – the rapid evolution of Web technologies continues to privilege the human as a key agent, both as provider and consumer of content, and this in turn is investing humanities scholarship

With IEEE *Xplore*, learn how technology impacts fields such as…

Entertainment: computer graphics, animation, 3D, digital motion pictures, laser projectors, and more



Bringing Physical Characters to Life

Akhil J. Madhani
Walt Disney Imagineering R&D

Abstract

At Disney, we are s
to present these ch
entertainment robot
Disney in attraction

In this talk, I hope
Disney. In particul
distilled from Disne

As examples of cha
I discuss two newer
the Disney theme
developed in conju
and has made appe

Ray Tracing for the Movie 'Cars'

Per H. Christensen* Julian Fong David M. Laur Dana Batali

Pixar Animation Studios

ABSTRACT

This paper describes how we extended Pixar's RenderMan renderer with ray tracing abilities. In order to ray trace highly complex scenes we use multiresolution geometry and texture caches, and use ray differentials to determine the appropriate resolution. With this method we are able to efficiently ray trace scenes with much more geometry and texture data than there is main memory. Movie-quality rendering of scenes of such complexity had only previously been possible with pure scanline rendering algorithms. Adding ray

texture cache keeps recently accessed texture tiles ready for fast access. This combination of ray differentials and caching makes ray tracing of very complex scenes feasible.

This paper first gives a more detailed motivation for the use of ray tracing in 'Cars', and lists the harsh rendering requirements in the movie industry. It then gives an overview of how the REYES algorithm deals with complex scenes and goes on to explain our work on efficient ray tracing of equally complex scenes. An explanation of our hybrid rendering approach, combining REYES with ray tracing, follows. Finally, we measure the efficiency of our method on a

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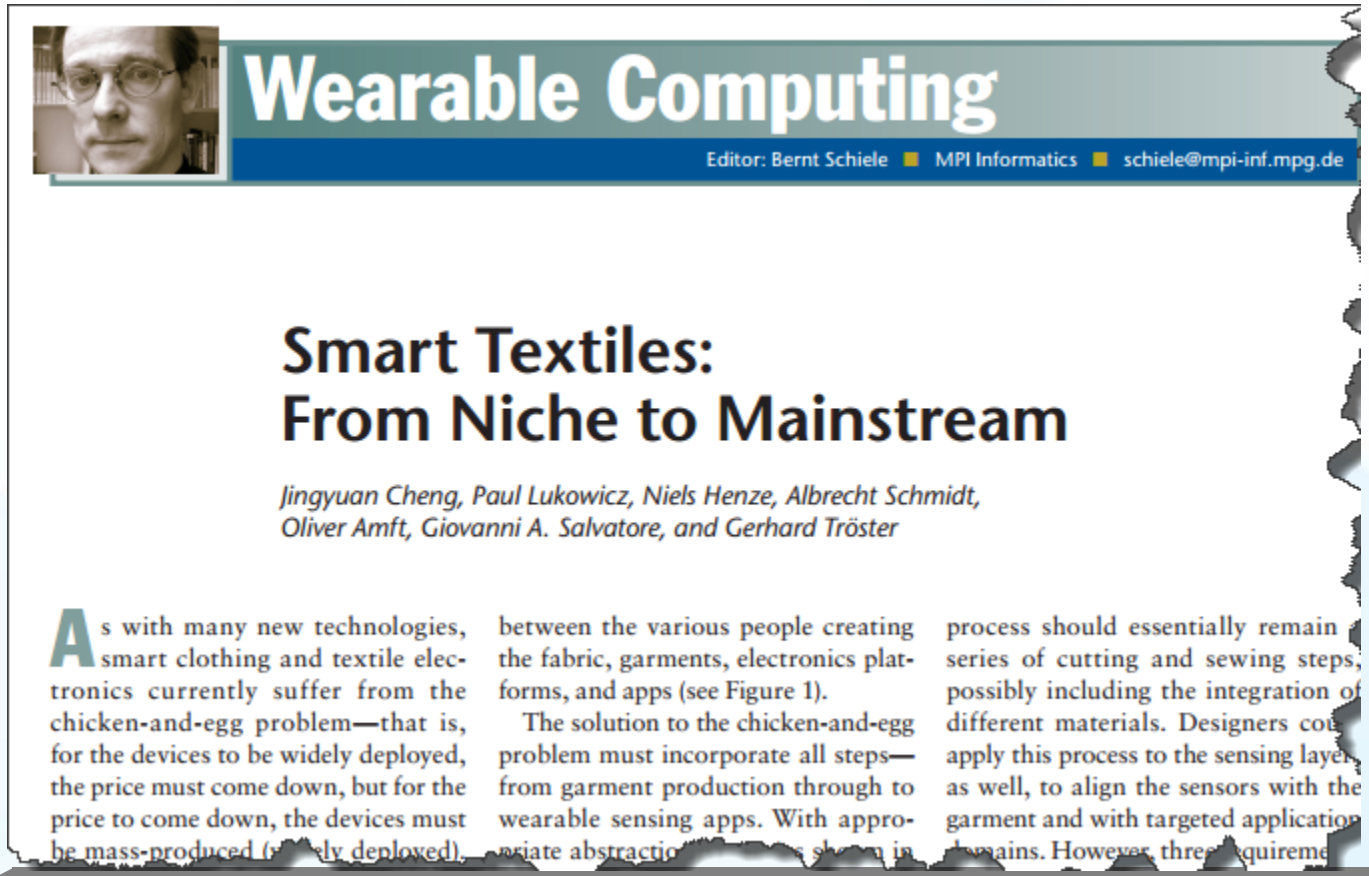
Apparel Design: e-textiles, smart fabrics, intelligent clothing, wearable computing, and more



Wearable Computing

Editor: Bernt Schiele ■ MPI Informatics ■ schiele@mpi-inf.mpg.de

Smart Textiles: From Niche to Mainstream

Jingyuan Cheng, Paul Lukowicz, Niels Henze, Albrecht Schmidt, Oliver Amft, Giovanni A. Salvatore, and Gerhard Tröster

As with many new technologies, smart clothing and textile electronics currently suffer from the chicken-and-egg problem—that is, for the devices to be widely deployed, the price must come down, but for the price to come down, the devices must be mass-produced (s ly deployed),

between the various people creating the fabric, garments, electronics platforms, and apps (see Figure 1).

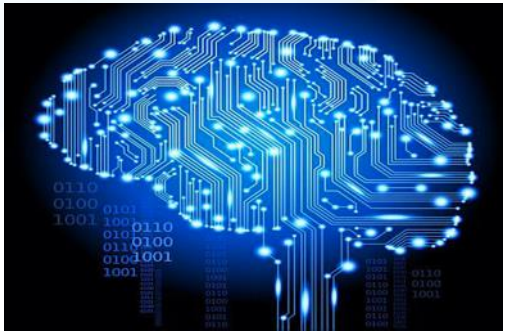
The solution to the chicken-and-egg problem must incorporate all steps—from garment production through to wearable sensing apps. With appro- riate abstracti s sh n in

process should essentially remain series of cutting and sewing steps, possibly including the integration o different materials. Designers co apply this process to the sensing laye as well, to align the sensors with the garment and with targeted applicatio domains. However, three equireme

IEEE

New IEEE Journals Planned for 2017

In 2017, IEEE will introduce six new journals that will be available for subscription:



- *IEEE **Communications Standards** Magazine*
- *IEEE Journal of **Electromagnetics, RF and Microwaves in Medicine and Biology***
- *IEEE Transactions on **Emerging Topics in Computational Intelligence***
- *IEEE Transactions on **Green Communications and Networking***
- *IEEE Transactions on **Radiation and Plasma Medical Sciences***
- *IEEE Journal of **Radio Frequency Identification***

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IEEE

New IEEE Journals Coming in 2016

In 2016, IEEE will introduce four new journals that will be available for subscription:

- *IEEE Transactions on* ***Intelligent Vehicles***
- *IEEE Journal on* ***Multiscale and Multiphysics Computational Techniques***
- *IEEE* ***Robotics and Automation Letters***
- *IEEE Transactions on* ***Sustainable Computing***

All included in an IEL subscription

For a complete title listing, to go: http://ieeexplore.ieee.org/xpl/opacjrn.jsp

New IEEE Journals from 2015

- *IEEE Trans. on* ***Big Data***
- *IEEE Trans. on* ***Transportation Electrification***
- *IEEE Trans. on* ***Cognitive Communications and Networking***
- *IEEE Trans. on* ***Computational Imaging***
- *IEEE Trans. on* ***Molecular, Biological, and Multi-Scale Communications***
- *IEEE Trans.* ***on Multi-Scale Computing Systems***
- *IEEE Trans. on* ***Signal and Information Processing over Networks***
- *IEEE* ***Systems, Man, and Cybernetics*** *Magazine*

All included in an IEL subscription

For a complete title listing, to go: http://ieeexplore.ieee.org/xpl/opacjrn.jsp

A sampling of some of the new conferences added in 2015

- **Big Data Software Engineering** (BIGDSE), 2015 IEEE/ACM 1st International Workshop on
- **Computational Electromagnetics** (ICCEM), 2015 IEEE International Conference on
- **DC Microgrids** (ICDCM), 2015 IEEE First International Conference on
- **Electromagnetic Compatibility and Signal Integrity**, 2015 IEEE Symposium on
- **Identity, Security and Behavior Analysis (ISBA)**, 2015 IEEE International Conference on
- **Industrial Engineering and Operations Management** (IEOM), 2015 International Conference on
- **Microwaves for Intelligent Mobility** (ICMIM), 2015 IEEE MTT-S International Conference on
- **Multimedia Big Data** (BigMM), 2015 IEEE International Conference on
- **Networking Systems and Security** (NSysS), 2015 International Conference on
- **Sampling Theory and Applications** (SampTA), 2015 International Conference on
- **Signal Processing, Informatics, Communication and Energy Systems** (SPICES), 2015 IEEE International Conference on
- **Smart Cities Conference** (ISC2), 2015 IEEE First International

Examples of New IEEE Conferences in 2014

- **Internet of Things** (WF-IoT), 2014 IEEE World Forum on
- **Humanitarian Technology** Conference, (IHTC), 2014 IEEE Canada International
- **Aerospace Electronics and Remote Sensing Technology** (ICARES), 2014 IEEE International Conference on
- **Antenna Measurements & Applications** (CAMA), 2014 IEEE Conference on
- **Consumer Electronics**, Taiwan (ICCE-TW), 2014 IEEE International Conference on
- **Energy Conversion** (CENCON), 2014 IEEE Conference on
- **Ethics in Science**, Technology and Engineering, 2014 IEEE International Symposium on
- **Transportation Electrification** Asia-Pacific (ITEC Asia-Pacific), 2014 IEEE Conference and Expo
- **Intelligent Energy** and Power Systems (IEPS), 2014 IEEE International Conference on
- **Quantum Optics Workshop** (QOW), 2014
- **Sensor Systems for a Changing Ocean** (SSCO), 2014 IEEE
- **Wireless and Mobile**, 2014 IEEE Asia Pacific Conference on
- **Industrial Engineering and Information Technology** (IEIT), 2014 International Conference on
- **Guidance, Navigation and Control Conference** (CGNCC), 2014 IEEE Chinese

IEEE

A sampling of some of the new conferences added in 2016

- **Cloud Computing and Big Data** Analysis (ICCCBDA), 2016 IEEE International Conference on
- **Computer Communication and the Internet** (ICCCI), 2016 First IEEE International Conference on
- **Connected Health:** Applications, Systems and Engineering Technologies (CHASE), 2016 IEEE First International Conference on
- **Control, Measurement and Instrumentation** (CMI), 2016 IEEE First International Conference on
- **Electrical Systems for Aircraft, Railway, Ship Propulsion and Road Vehicles** & International Transportation Electrification Conference (ESARS-ITEC), 2016 International Conference on
- **Intelligent Systems Engineering** (ICISE), 2016 International Conference on
- **Intelligent Transportation Engineering** (ICITE), 2016 IEEE International Conference on
- **Mechatronics, Adaptive and Intelligent Systems (MAIS),** 2016 IEEE Conference on
- **Power Electronics, Intelligent Control and Energy Systems** (ICPEICES), 2016 IEEE 1st International Conference on
- **The Science of Electrical Engineering** (ICSEE), 2016 IEEE International Conference on

Popular IEEE Standards

IEEE 802 Series—IEEE Standard for Ethernet

IEEE 3000 Standards Collection™—Formerly the IEEE Color Books®, this collection will reorganize the 13 Color Books into approximately 70 "dot" standards covering specific technical topics on all facets of industrial and commercial power systems.

IEEE 81-2012™—IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System

2017 National Electrical Safety Code® (NESC®)—Sets the ground rules for practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communications lines and associated equipment.

IEEE 43™—IEEE Recommended Practice for Testing Insulation Resistance of Electric Machinery

IEEE 80™—IEEE Guide for Safety in AC Substation Grounding

IEEE 81™—IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System

Setting up Rooming Mobile Access

Off-campus/Remote Access for laptop, tablet, phone

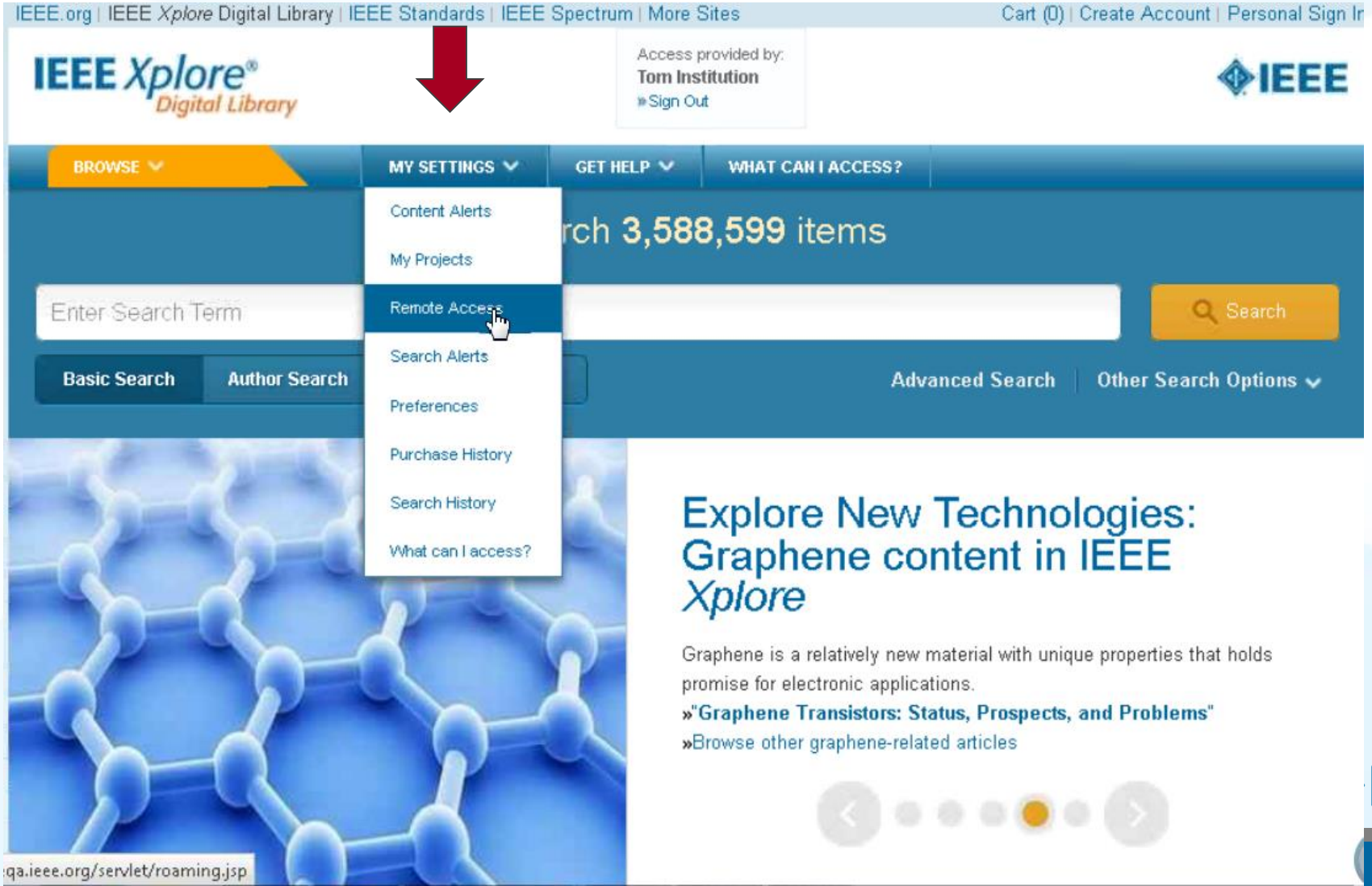
Roaming Mobile Access

- Allows for access to IEEE *Xplore* content when users are off-campus
- Can be set-up for multiple devices – laptop, tablet, phone
- Available for 90 days
- To initiate:
  - Login to IEEE *Xplore* from within your institution's IP range
  - Sign In with a personal IEEE Account
  - Select My Settings > Remote Access

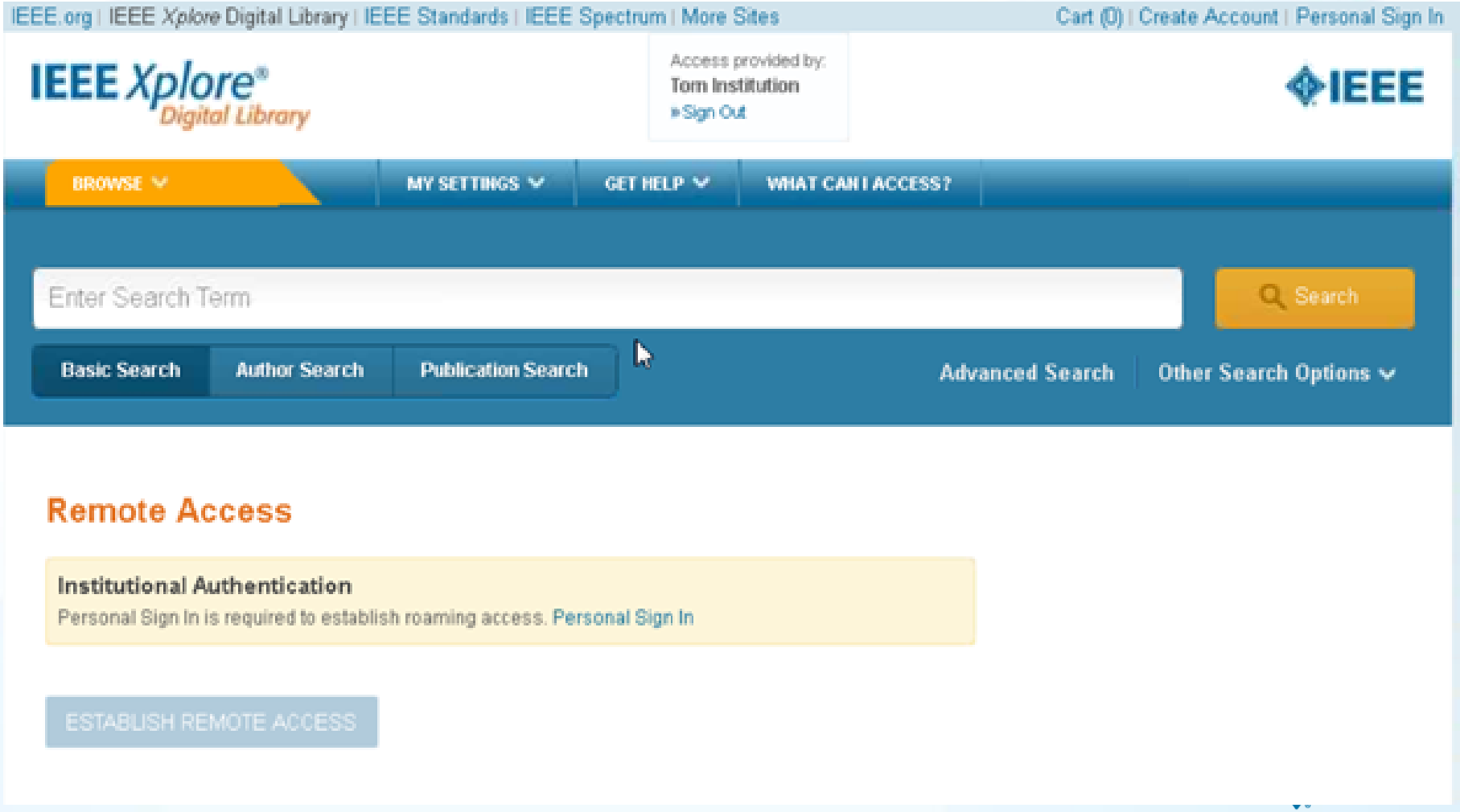
Libraries can have this feature enabled by contacting Online Support (onlinesupport@ieee.org) IT IS ENABLED for Cons. MEMBERS in RUSSIA

IEEE

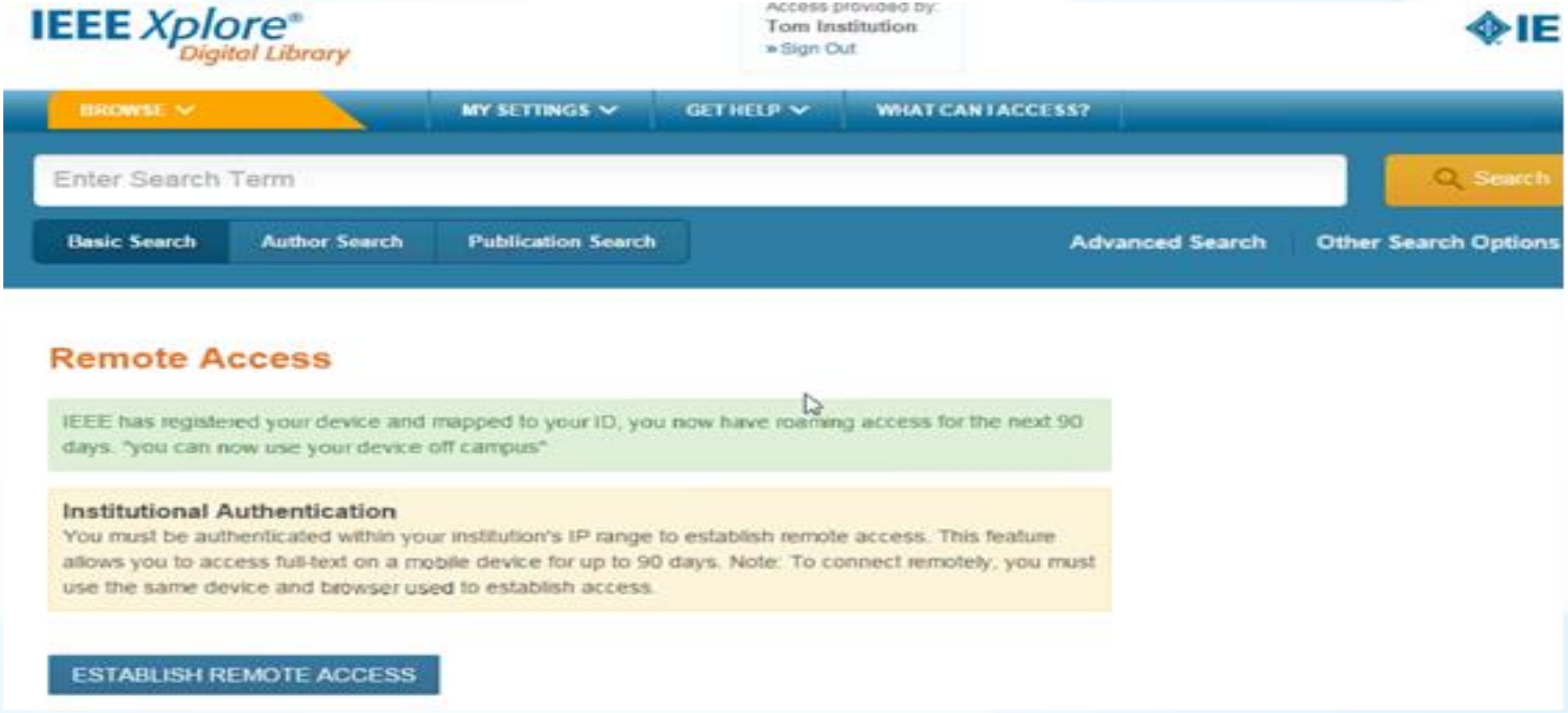
Roaming Mobile Access - How Roaming Access setup appears on IEEE *Xplore*:



Roaming Mobile Access - User prompted to create/sign in with personal IEEE account:

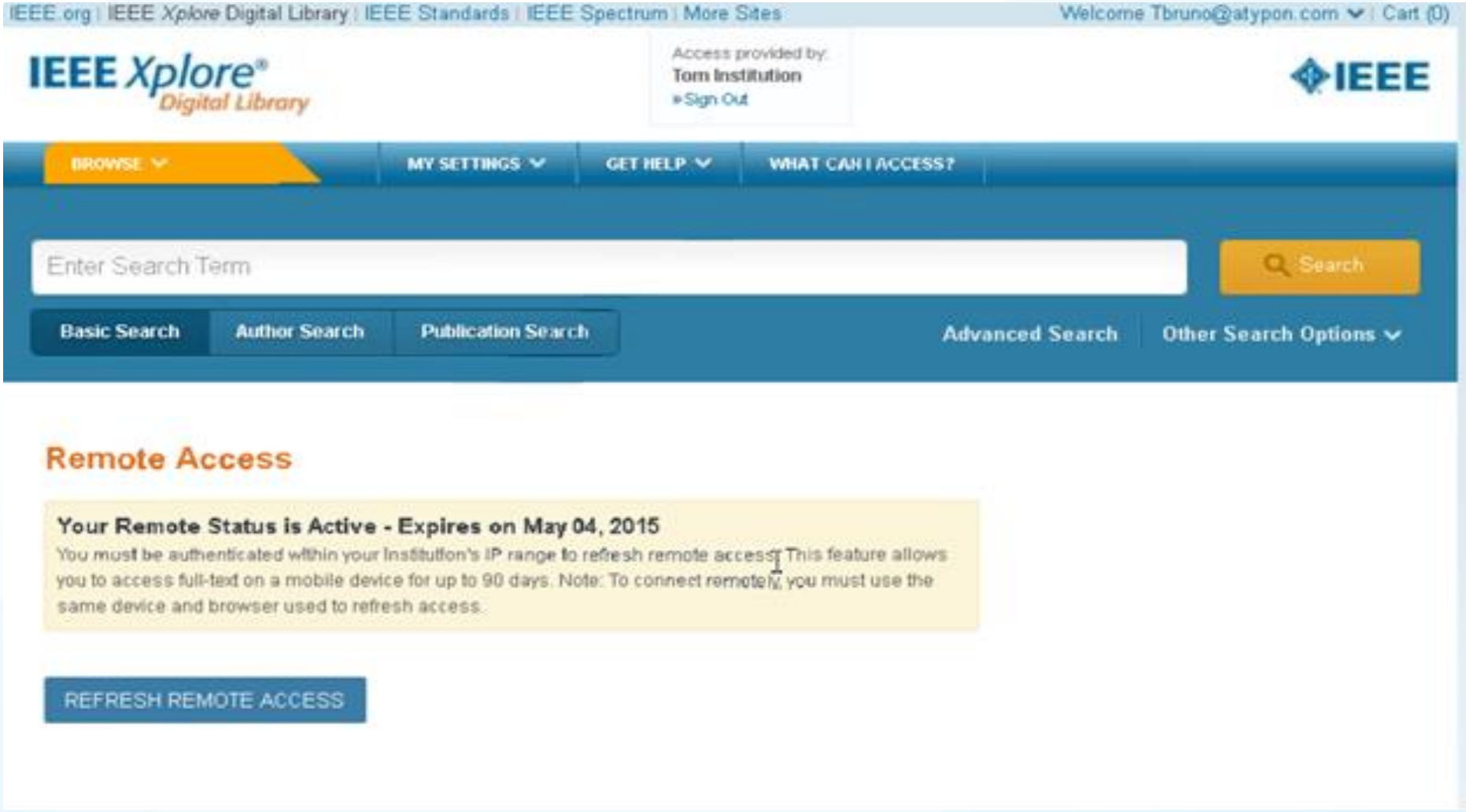


Roaming Mobile Access – Select Establish Remote Access to pair mobile device:



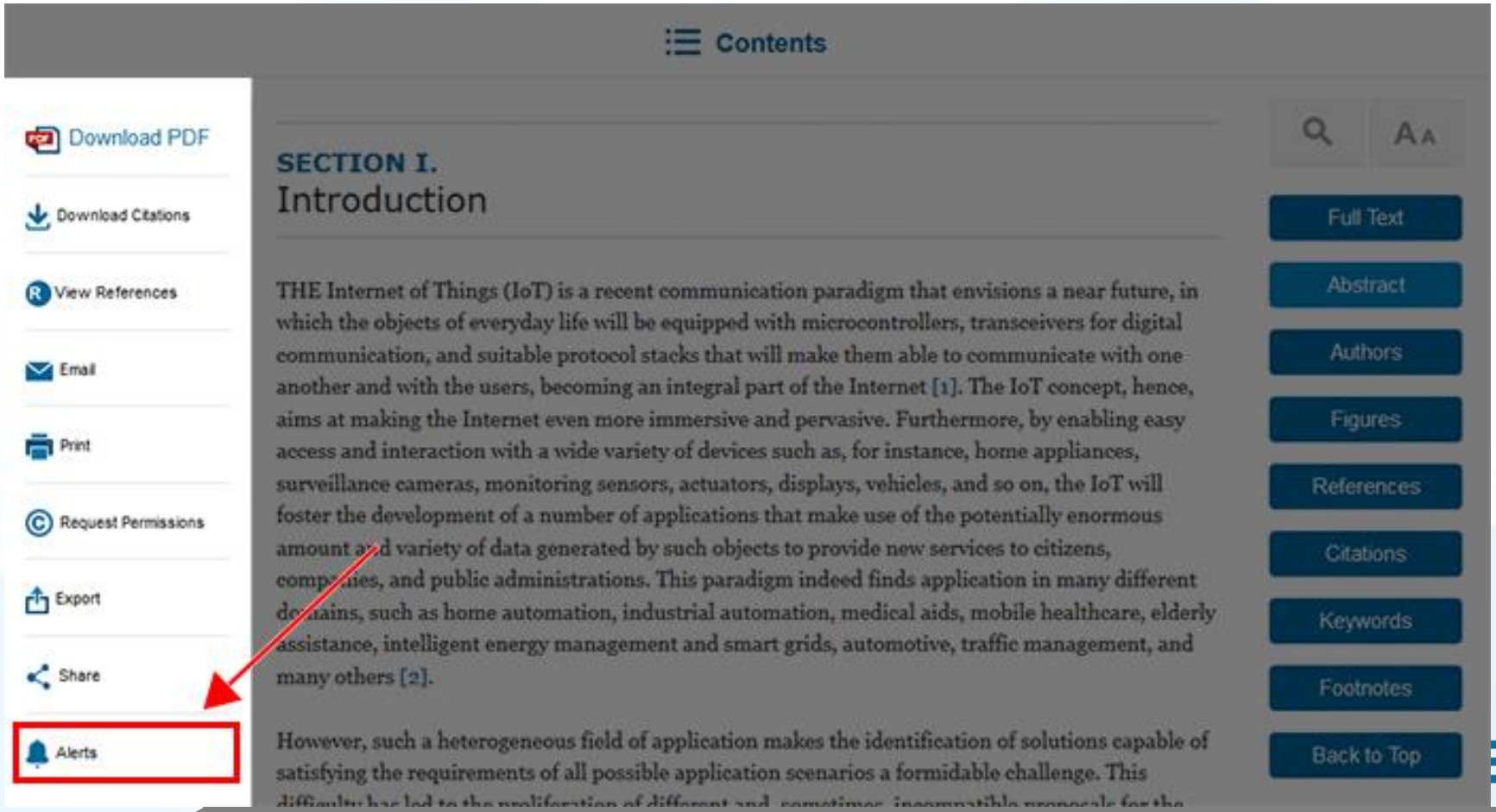
IEEE

Roaming Mobile Access – Every 90 days refresh remote access:



Citation alert

to receive an alert when the document is cited



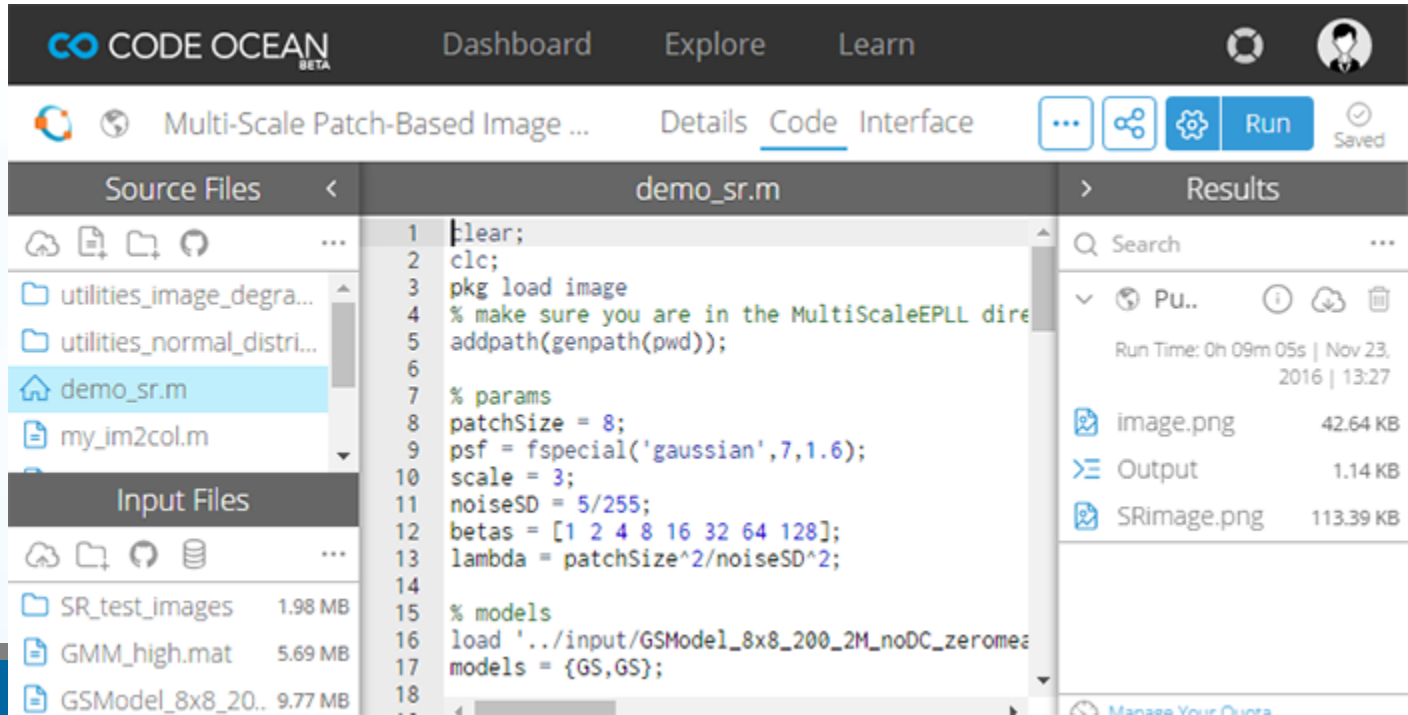
Algorithms in IEEE *Xplore*

This article contains an algorithm made available via IEEE's partnership with Code Ocean, a cloud service that allows users to view, run, modify, and download algorithms in IEEE *Xplore* articles. Click the algorithm name below to access it on the Code Ocean website.

Name: Multi-Scale Patch-Based Image Restoration - Super Resolution

Programming Language:

You must register for a free account to start using Code Ocean

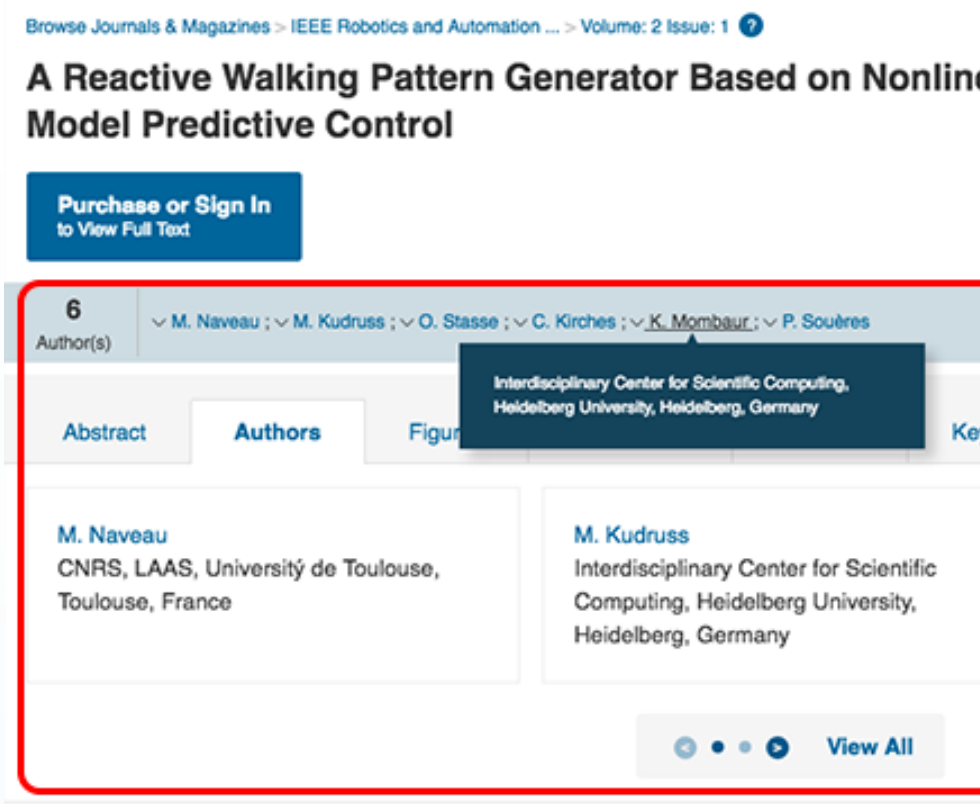


Redesign of Full-Text HTML Articles

- More prominent
  - article metrics
  - related articles
  - featured media
- Author's ORCID identifier & bio
- Metrics gallery
- Multimedia gallery

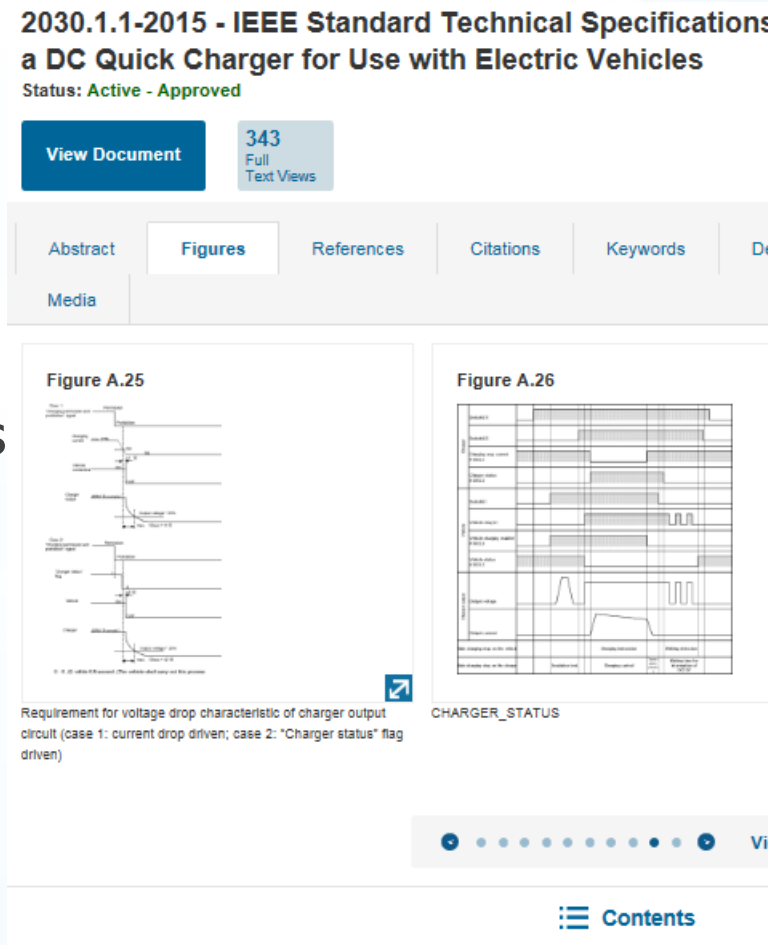
Secondary Author Affiliation

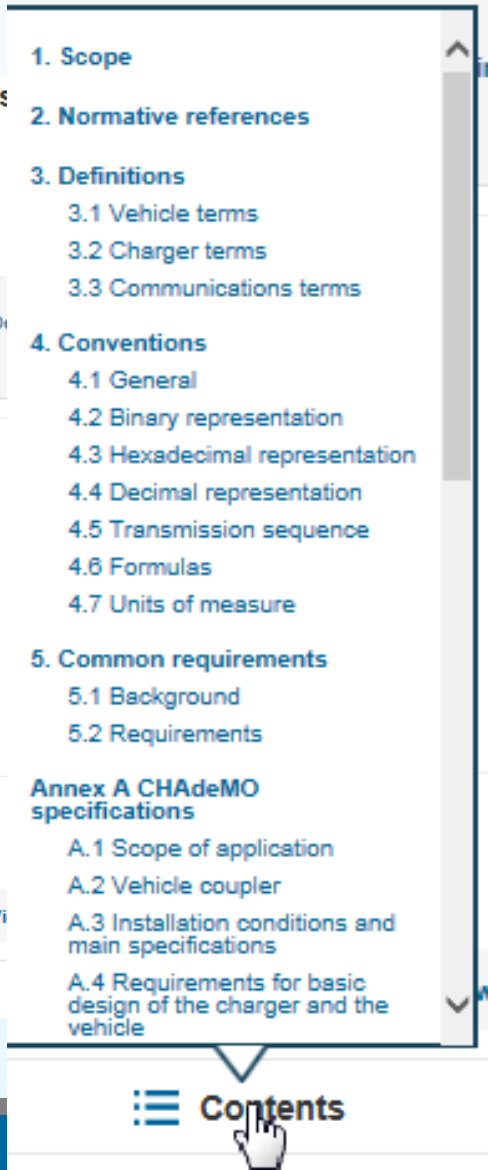
- Secondary author affiliations are now available on the new blended full text HTML/abstract page. Users will also be able to search for secondary authors based on their affiliation (like you would for a primary author).



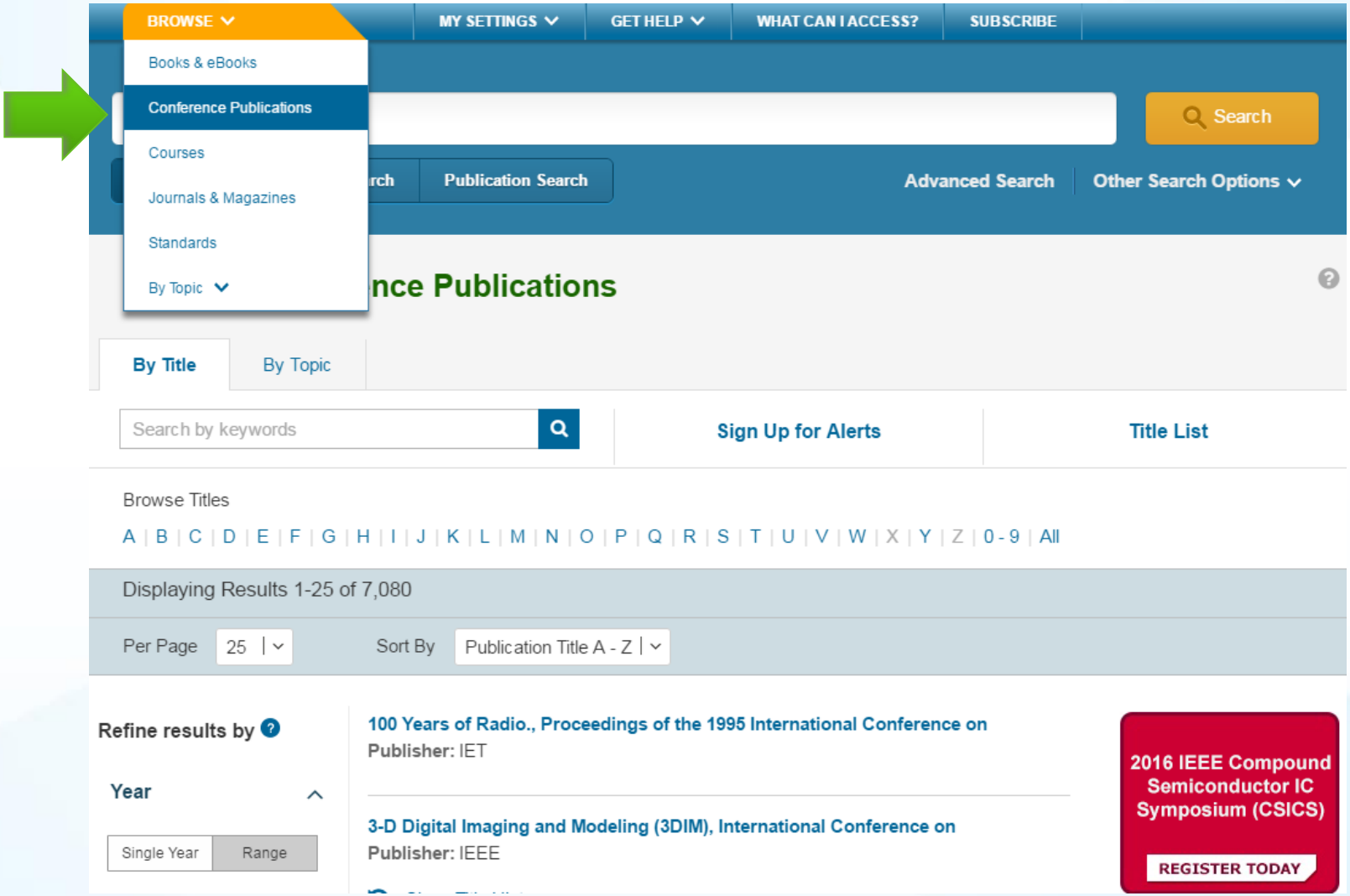
NEW! Full-Text HTML for Standards

- Modern, mobile-friendly design
- Figures carousel
- Table of contents within Standard
- Search within a Standard
- Evolution of the Standard



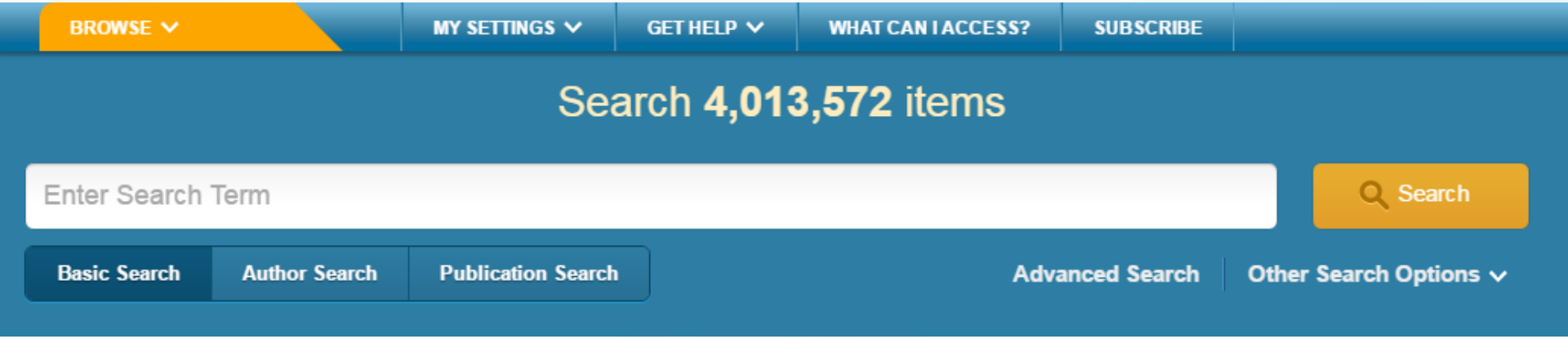


Browsing the Table of Contents



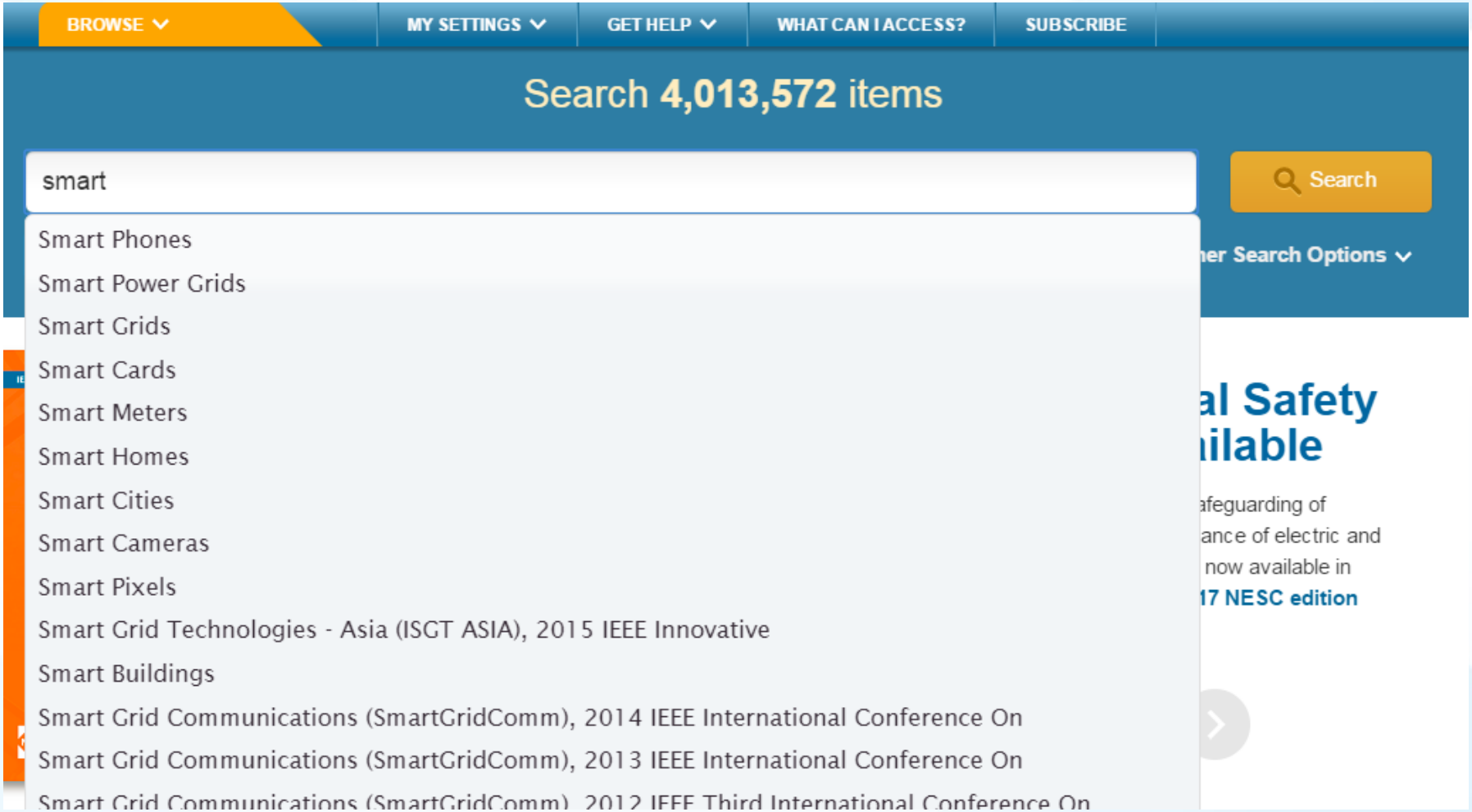
IEEE

Basic Search



- The Basic Search function searches **metadata only**
- Automatically ORs each search term
- Use quotes (“ ”) for an exact phrase
- Automatic stemming
- Case insensitive
- Type ahead (aka auto suggest) functionality

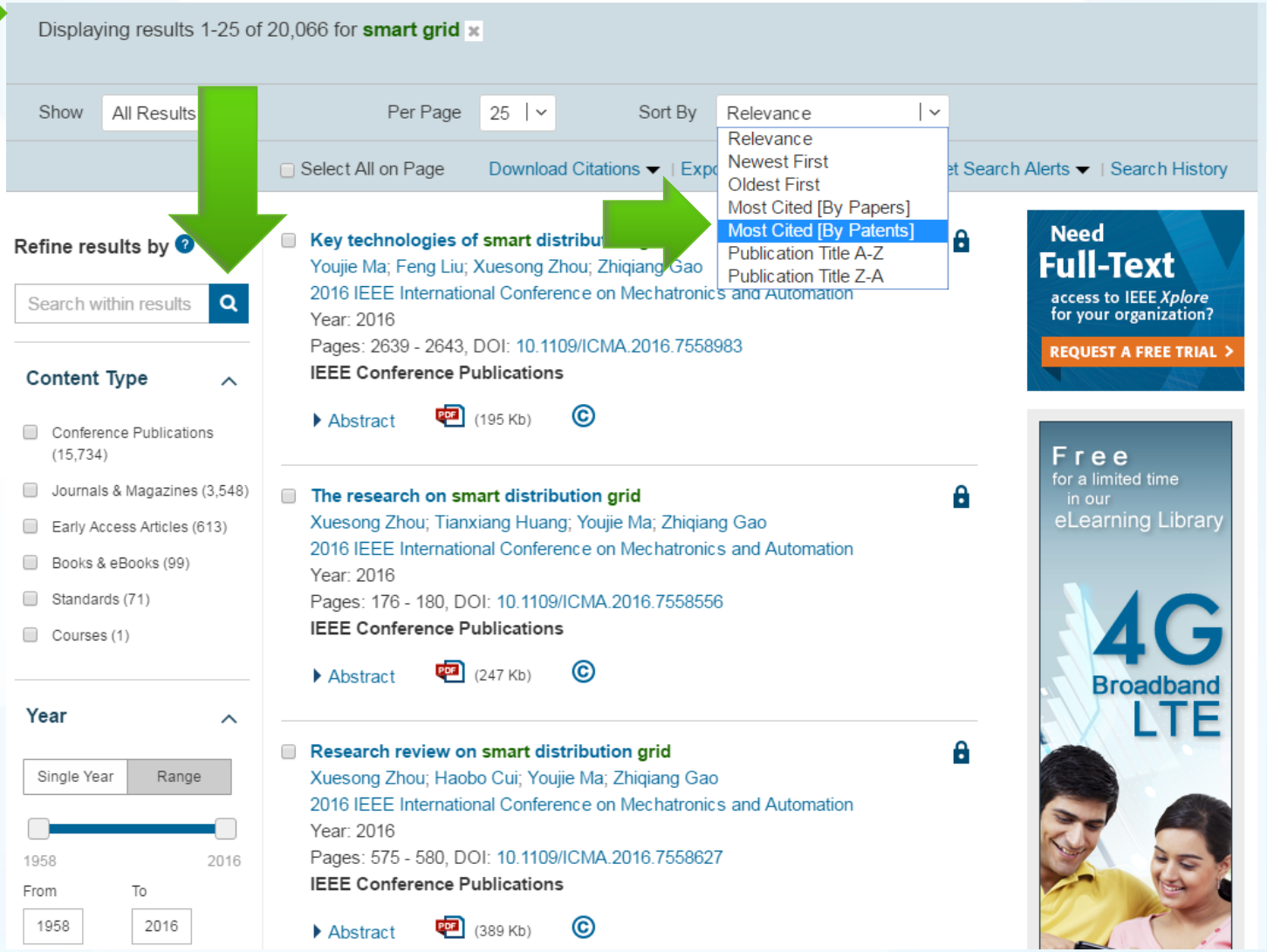
Type Ahead Feature – Explore Related Topics



Type Ahead Feature

- Type Ahead offers search suggestions as users type a term into a search box
- *Xplore* shows a maximum of 20 suggestions
- Ranking is based on "starts with"
- Based on a sub-set of fields:
  - Publication Title
  - Subject
  - Index Terms
- When a user selects one of the type-ahead terms, *Xplore* searches against all fields (Metadata)

Search Results and Refinements



IEEE *Xplore* Facets

Review list of facets:

- **Content Type:** Early Access and Draft Standards are a window into the future of technology
- **Author Affiliation:** Useful for competitive intelligence and to identify potential partners
- **Publication Title:** Helpful in identifying relevant conferences and journals to read

New! Unified Abstract & HTML View

View Figures

Abstract | Au | **Figures** | References | Citations | Keywords | Metrics | Media

Fig.1.

Distributed generation system emulator set with cont
the laboratory

Fig. 2.

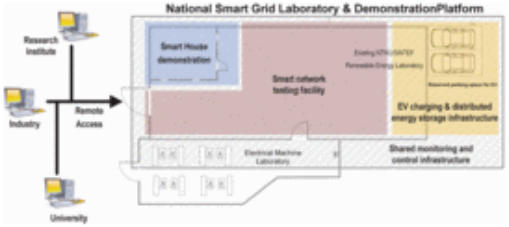
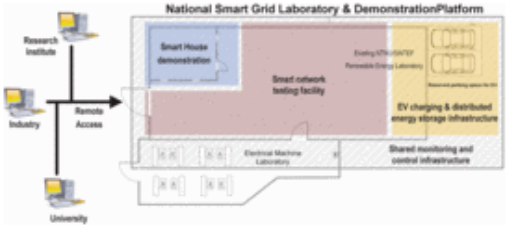


Fig. 3.

acilities of the demo norge distributed across

Fig. 2.



» View in Context

» View Full Size Image

View All

Equations: Copy Source Code

The Test Case Prioritization Problem.

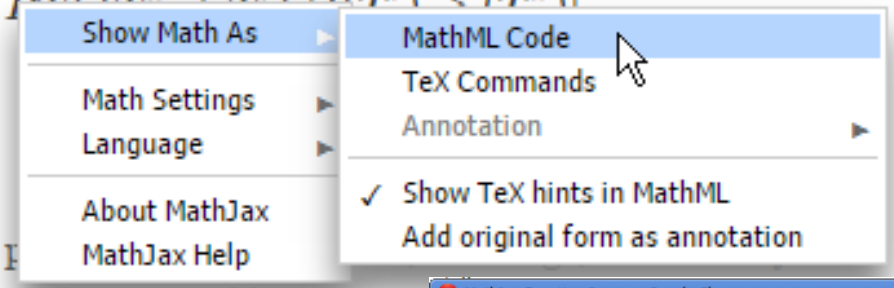
Given: T , a test suite; PT , the set of permutations of T ; f , a function from PT to the real numbers.

Problem: Find $T' \in PT$ such that

$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') > (T'')]$$

View Source

Here, PT represents the set of all p
function that, applied to any such ordering, yields an awar



Equations: Zoom Function

The Test Case Prioritization Problem.

Given: T , a test suite; PT , the set of permutations of T ; f , a function from PT to the real numbers.

Problem: Find $T' \in PT$ such that

$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') \geq (T'')].$$

View Source

Here, PT represents the set
function that, applied to any such ordering, yields an award value

Show Math As
Math Settings
Language
About MathJax
MathJax Help
Zoom Trigger
Zoom Factor
Math Renderer
Scale All Math ...
Hover
Click
Double-Click
No Zoom
Trigger Requires:
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The Test Case Prioritization Problem.

Given: T , a test suite; PT , the set of permutations of T ; f , a function from PT to the real numbers.

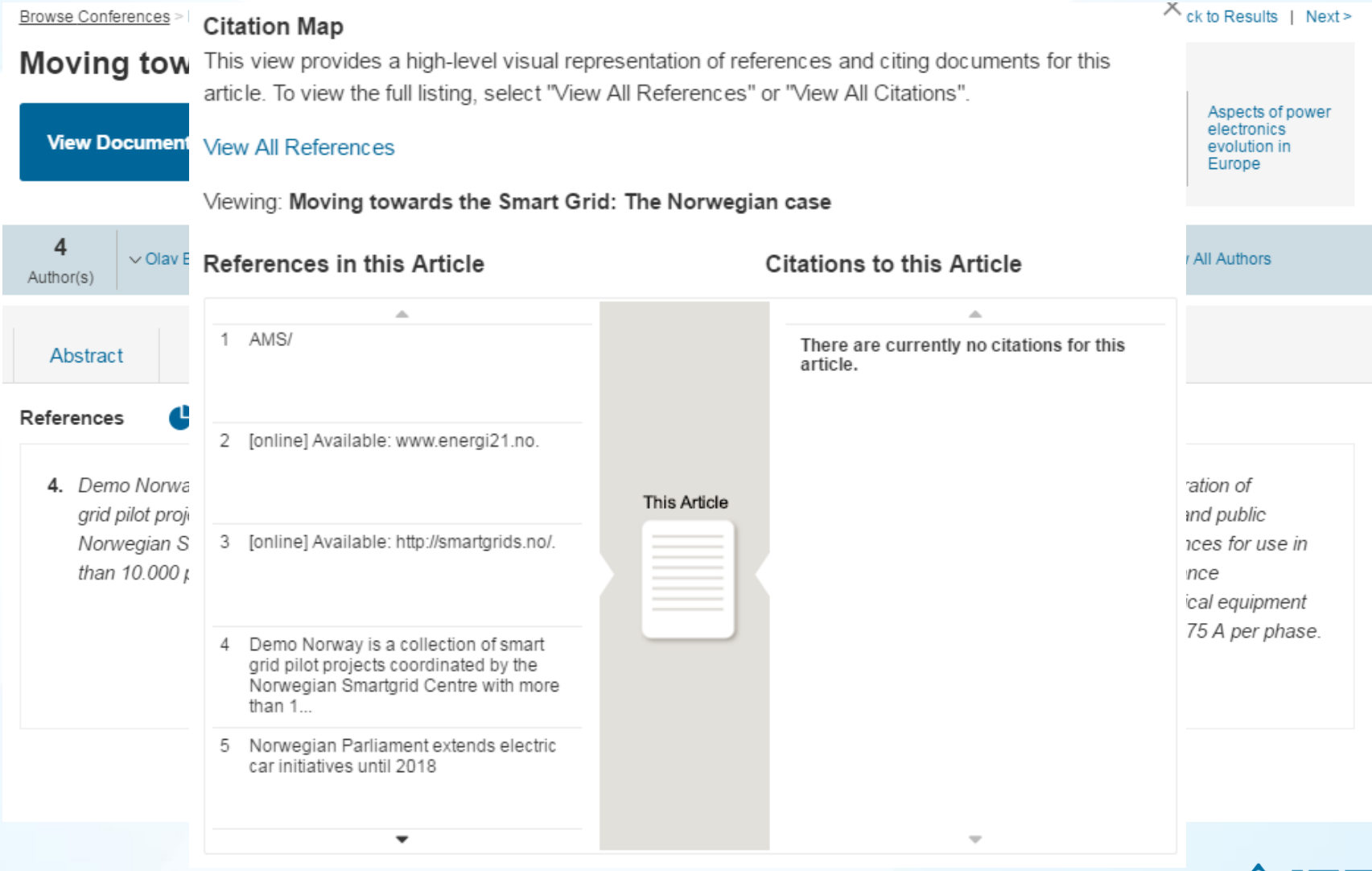
$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') \geq (T'')].$$

View Source

Here, PT represents the set of all possible prioritizations (orderings) of T and f is a function that, applied to any such ordering, yields an award value for that ordering.

References, Citations & Citation Map

References, Citations & Citation Map



Keywords

Moving towards the Smart Grid: The Norwegian case

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82
Full
Text Views

Related Articles

Automotive electrical systems-the power electroni...

Table of contents

Aspects of power electronics evolution in Europe

4
Author(s)

Olav B. Fosso ; Marta Molinas ; Kjell Sand ; Grete H. Coldevin

View All Authors

Abstract | Authors | Figures | References | Citations | **Keywords** | Metrics | Media

IEEE Keywords

Monitoring,
Context,
Europe,
Consumer electronics

INSPEC: Controlled Indexing

smart power grids,
power electronics

INSPEC: Non-Controlled Indexing

power electronics technologies,
smart grid,
global developments,
sustainable energy solutions,
environment friendly energy solutions

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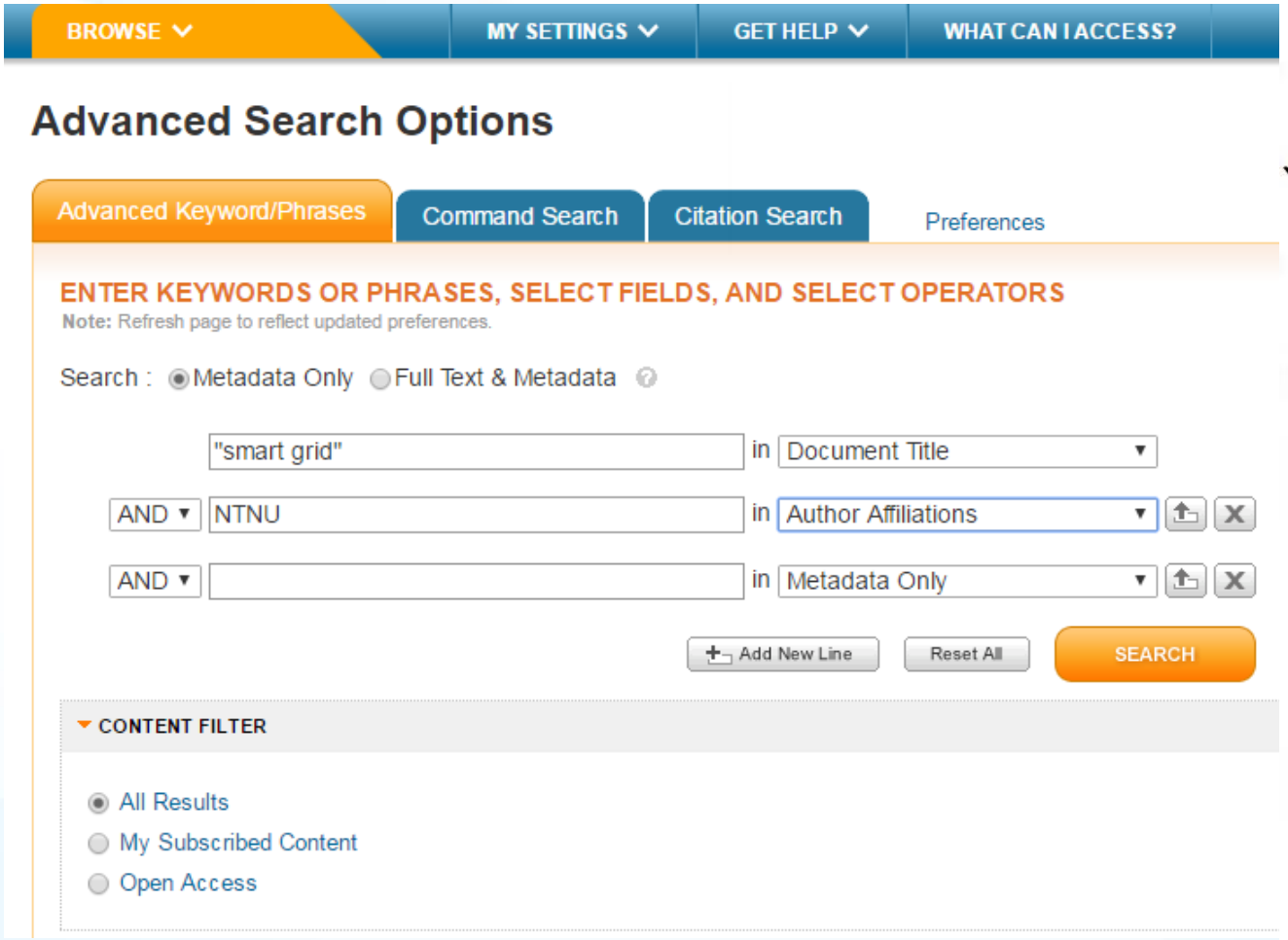
IEEE

Advanced Search - Affiliation & Fields



- Metadata Only
- Document Title
- Authors
- Publication Title
- Abstract
- Index Terms
- ✓ Author Affiliations
- Accession Number
- Article Number
- Author Keywords
- DOE Terms
- DOI
- IEEE Terms
- INSPEC Controlled Terms
- INSPEC Non-Controlled Terms
- ISBN
- ISSN
- Issue
- MeSH Terms
- PACS Terms
- Parent Publication Number
- Publication Number
- Standard Number
- Standards Dictionary Terms
- Topic

IEEE

Advanced Search

- Access from the link below the Global Search Box
- Default searches the Metadata
- Can search Full-Text and Metadata by selecting radio button
- Can search within specific fields such as Author and Index Terms by using the drop down menu
- Can add up to ten search boxes
- Combine search terms/phrases with AND, OR, NOT
- Use ASCII "quotes" for an exact phrase
- Automatic Stemming
  - Pluralized nouns (computer=computers)
  - Verb tenses (run=running, ran, etc.)
  - British and American spelling variations (fiber=fibre)

IEEE

Asterisk (Wildcard) Rules

- The * wildcard can be used at the end of a word, at the beginning of a word, or in the middle of a word
- Must have **at least 3 characters** to use the * wildcard
- Can not use the * wildcard when searching full-text
- Can not use the * wildcard with proximity operators (NEAR and ONEAR)
- Can not use the * wildcard within quotes for an exact phrase
- Limited to five * wildcards per search
- Simulate* will find simulates and simulated but NOT simulating
- Simulat* will find simulating, simulated, simulates, simulator, simulation, etc.

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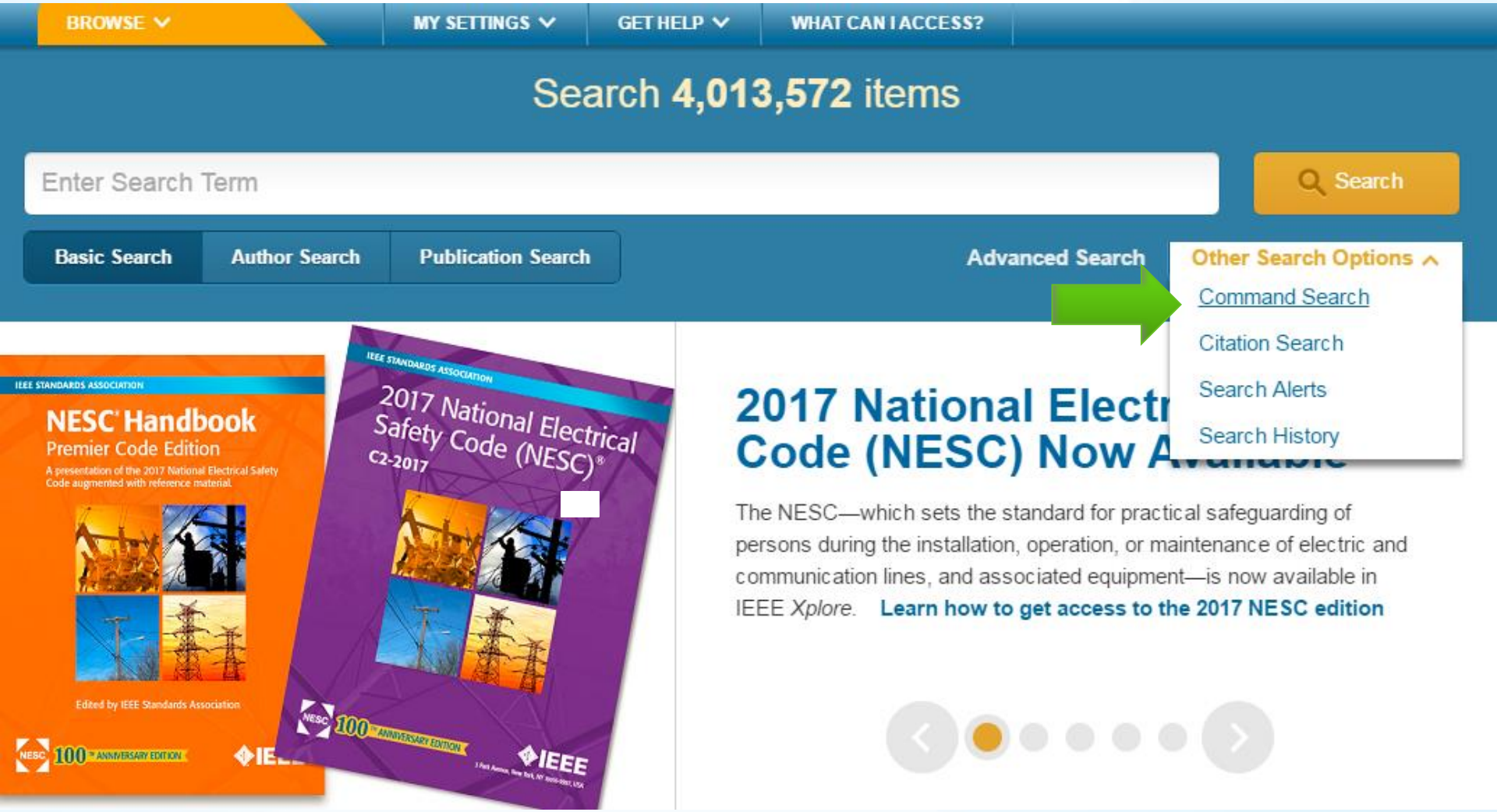
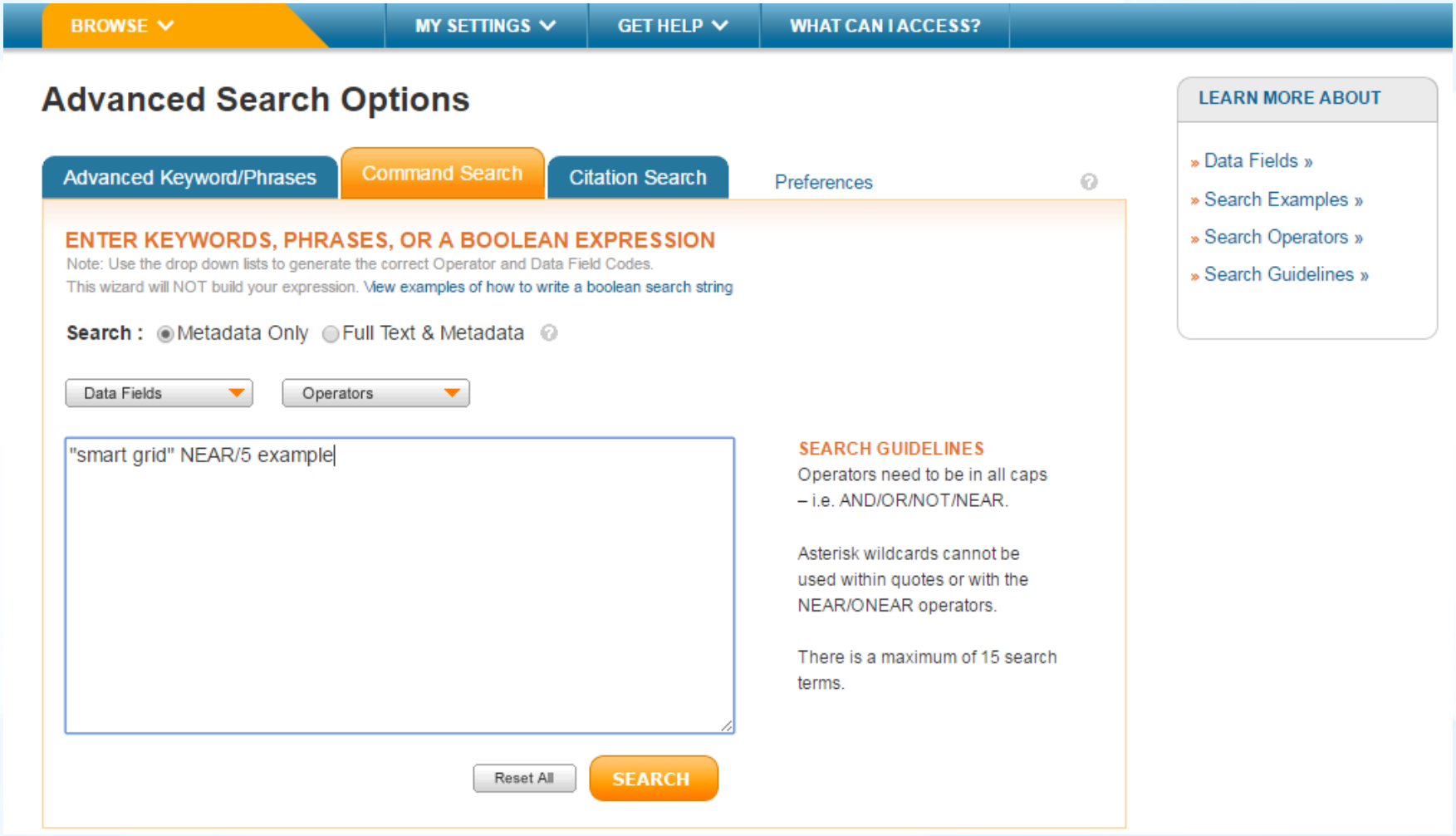
Command Search



Command Search



Command Search – "AND" vs. "NEAR" in Metadata Only

800 results (AND) vs. 57 (NEAR)

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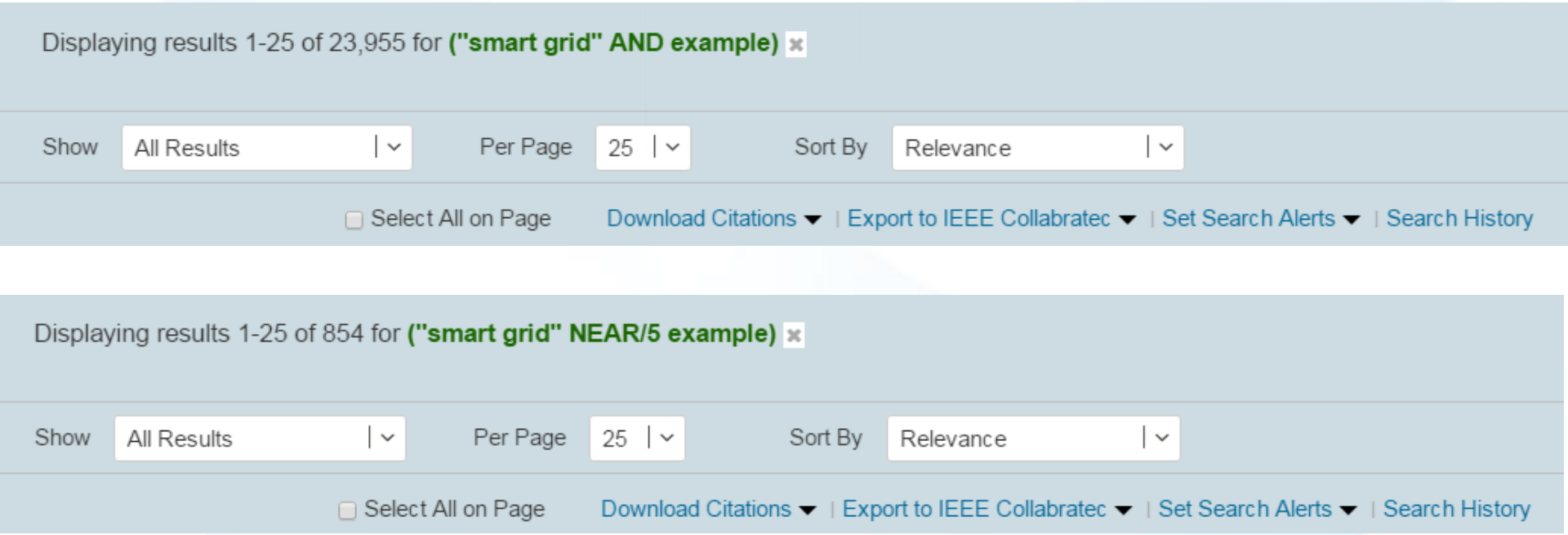
Command Search – "AND" vs. "NEAR" in Full Text



23,955 results (AND) vs. 854 (NEAR)

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Command Search

Operator	Syntax	Find Results That...
AND	***x* AND *y***	Match both expressions ***x*** and ***y*** Example: "wireless sensor network" AND security Finds articles with both the phrase ***wireless sensor network*** and the word ***security***
OR	***x* OR *y***	Match either expression ***x*** or ***y*** or both Example: REV OR "renewable energy vehicle" Finds articles with either the word ***REV*** or the phrase ***renewable energy vehicle***
NOT	***x* NOT *y***	Match expression ***x*** but *not* ***y*** Example: gasoline NOT diesel Finds articles that include the word ***gasoline*** but do not include the word ***diesel***
NEAR	***x* NEAR/# *y***	Match expression ***x*** within # words of ***y*** (***x*** can appear before or after ***y*** - NEAR does not designate order) Example: cardiac NEAR/3 implantable Finds articles with the word ***cardiac*** within three words of ***implantable***; cardiac can come before or after implantable.
ONEAR	***x* ONEAR/# *y***	Match expression ***x*** *before* and within # words of ***y*** (ONEAR does designate order) Example: cardiac ONEAR/3 implantable Finds articles with the word ***cardiac*** within three words of ***implantable***; cardiac must come before implantable.

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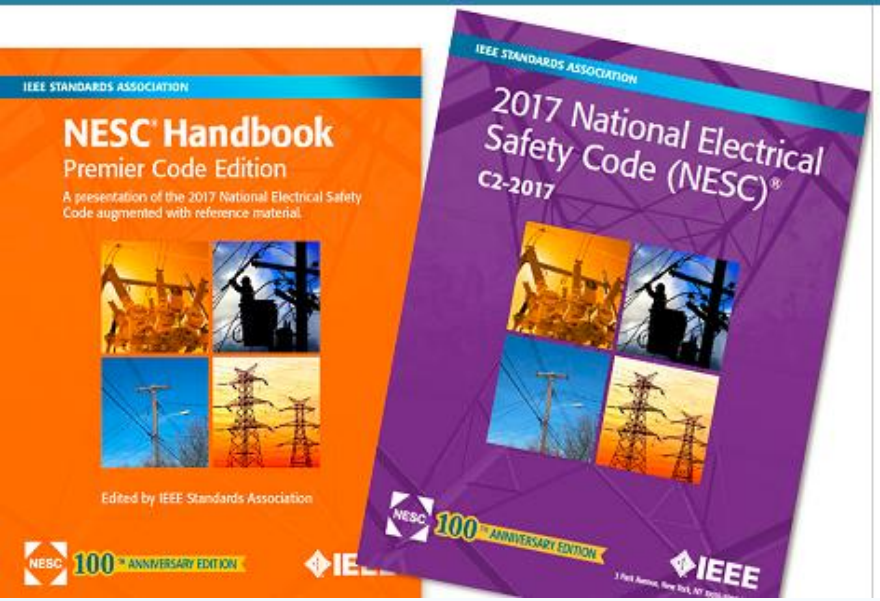
Author Search

BROWSE | MY SETTINGS | GET HELP | WHAT CAN I ACCESS?

Search **4,013,572** items

David | Root | Search

Basic Search | Author Search | Publication Search | Advanced Search | Other Search Options



2017 National Electrical Safety Code (NESC) Now Available

The NESC—which sets the standard for practical safeguarding of persons during the installation, operation, or maintenance of electric and communication lines, and associated equipment—is now available in IEEE *Xplore*. **Learn how to get access to the 2017 NESC edition**

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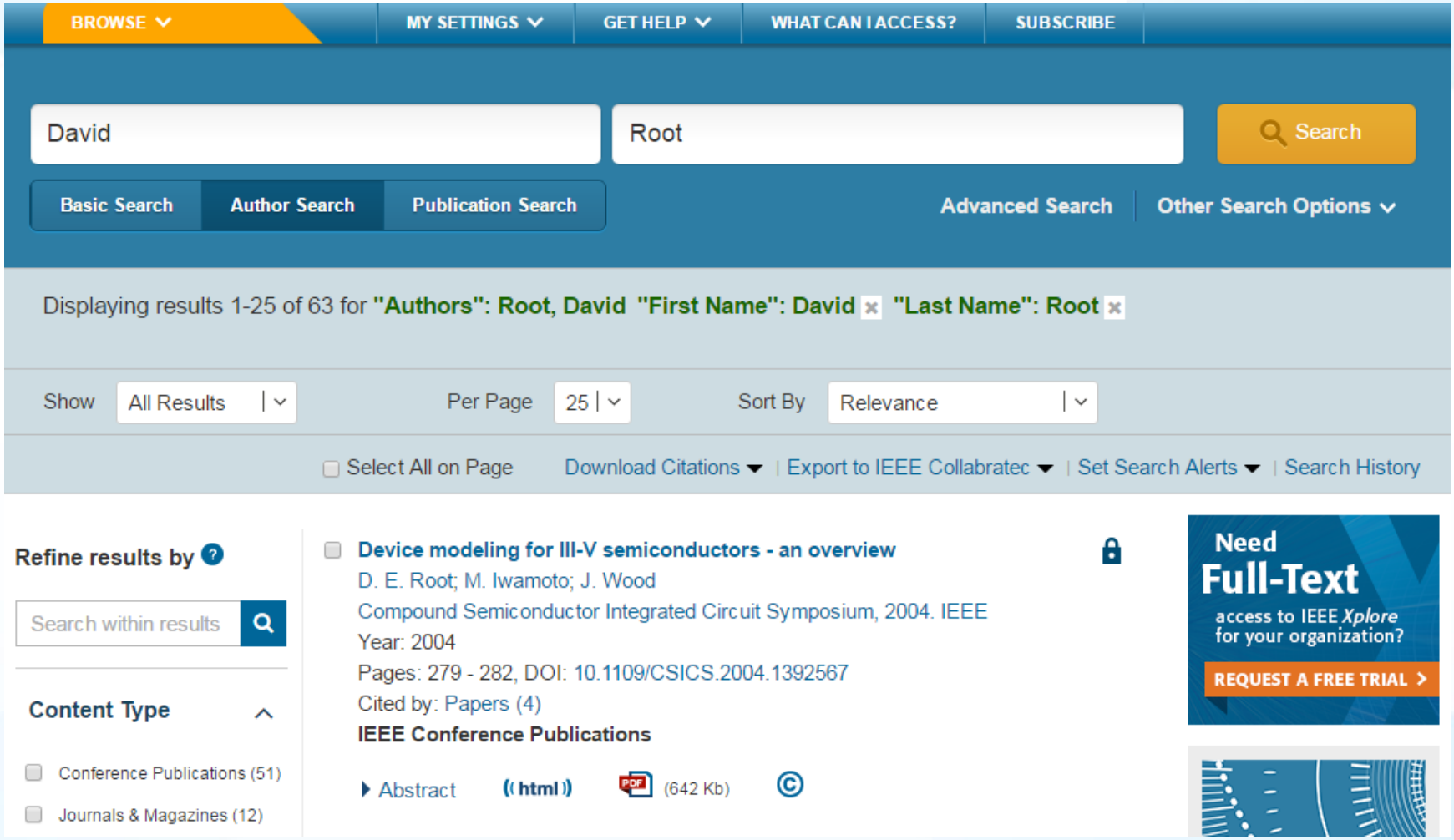
Author Search



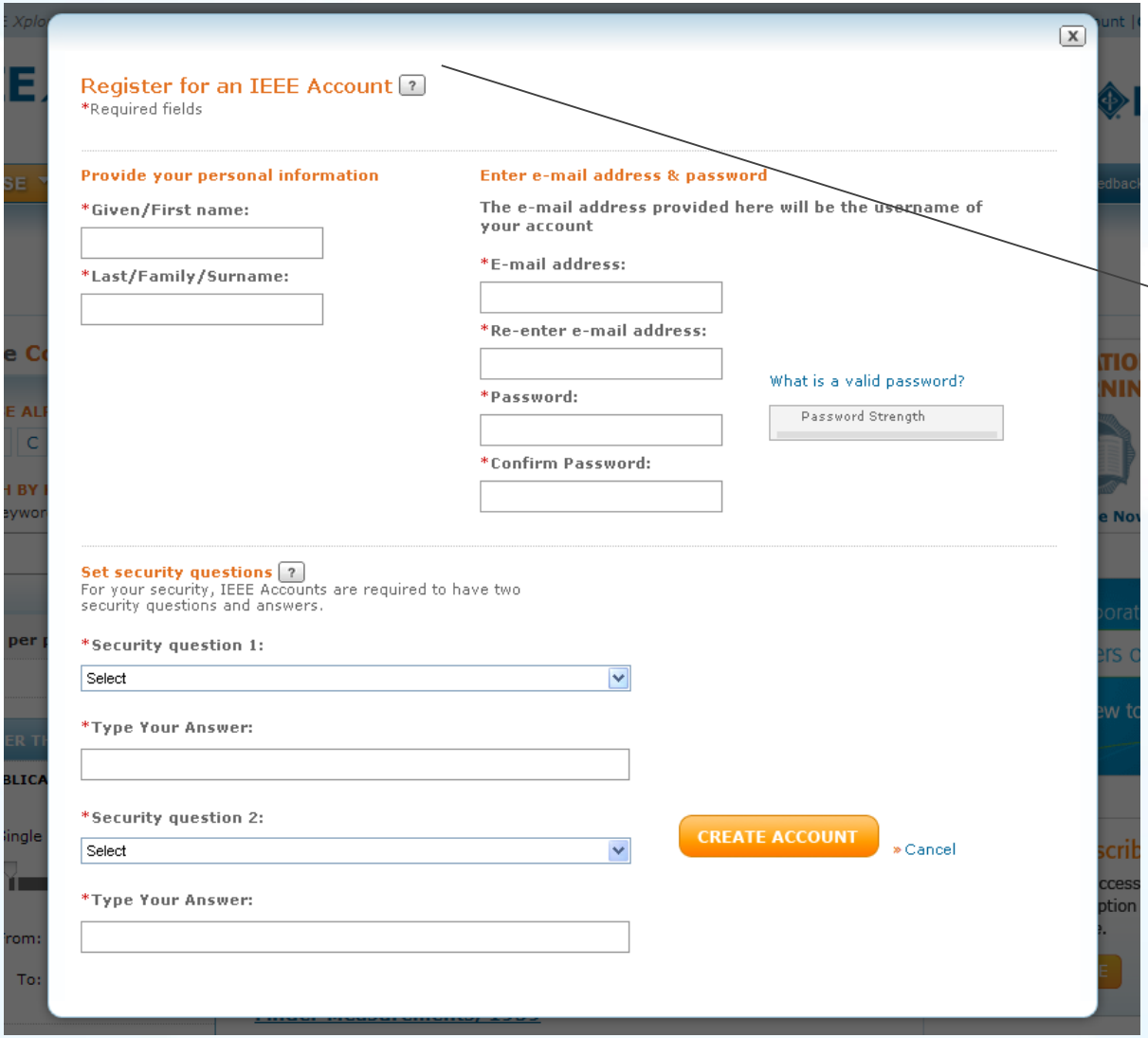
Author Search

- **Author search interface**: Select “Author Search” to reveal search fields for First Name, Middle Initial, and Last Name.
- **Recall of results**: Searching for David Root will also retrieve any articles this individual published under D. Root, D.E. Root, or any other variation.
- **Filter and refine search results**: Refine your search by choosing a normalized author name in the author facet on the search results page to retrieve any article linked to that author, regardless of the original name variation used on the article. The name displayed in the author facet is the longest possible version of the author’s name (in our example: David E. Root).

IEEE Personal Account Registration

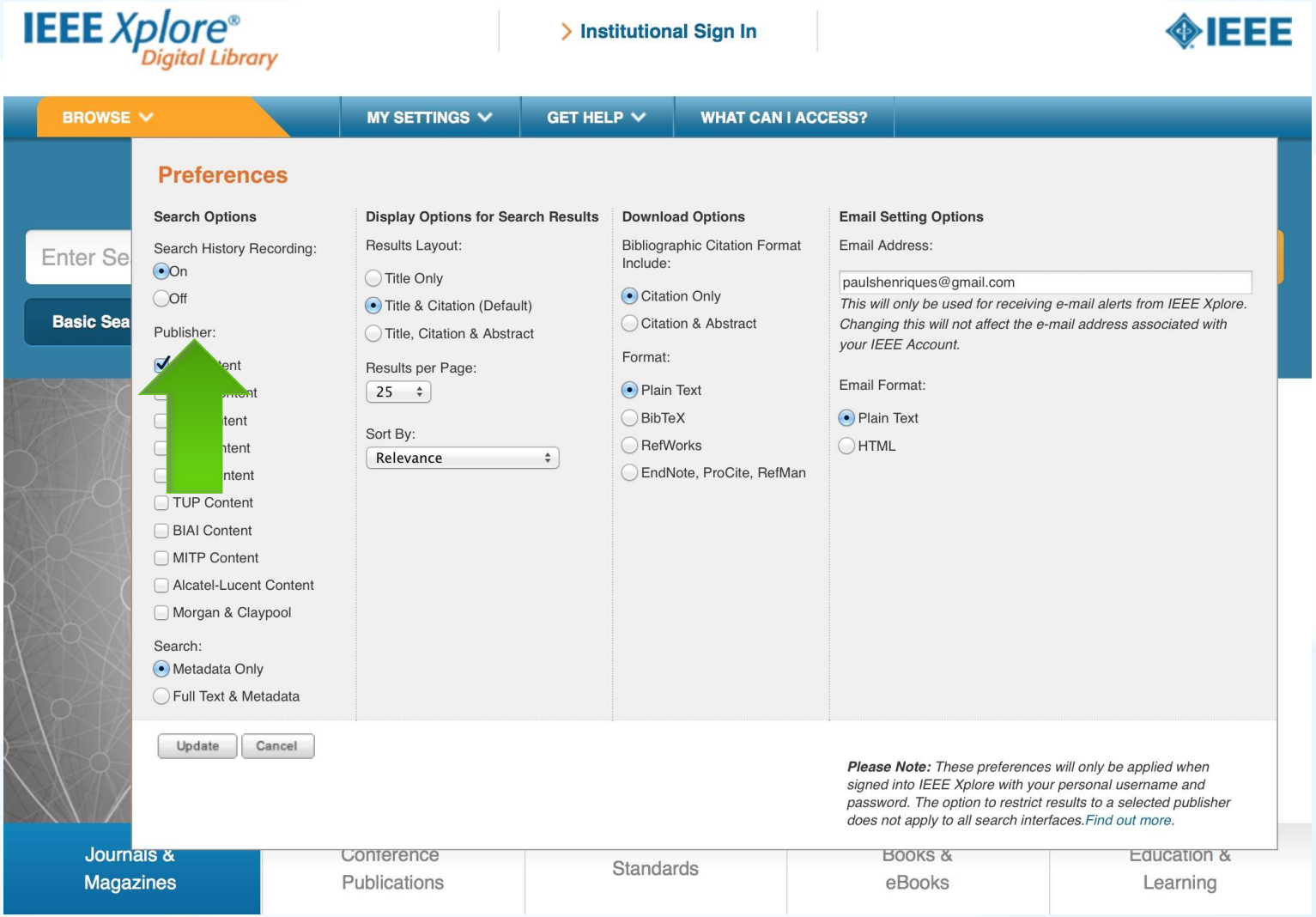
To take advantage of personalization features, such as search preferences and saved search alerts, users need to create an IEEE account by selecting the “Create Account” link on the top of any IEEE web page.

IEEE Personal Account Registration



The IEEE account registration process is an easy 3-click process – just fill out your First Name, Last Name, email address, password and two security questions. Your username is your email address.

Set Preferences with a Personal Account



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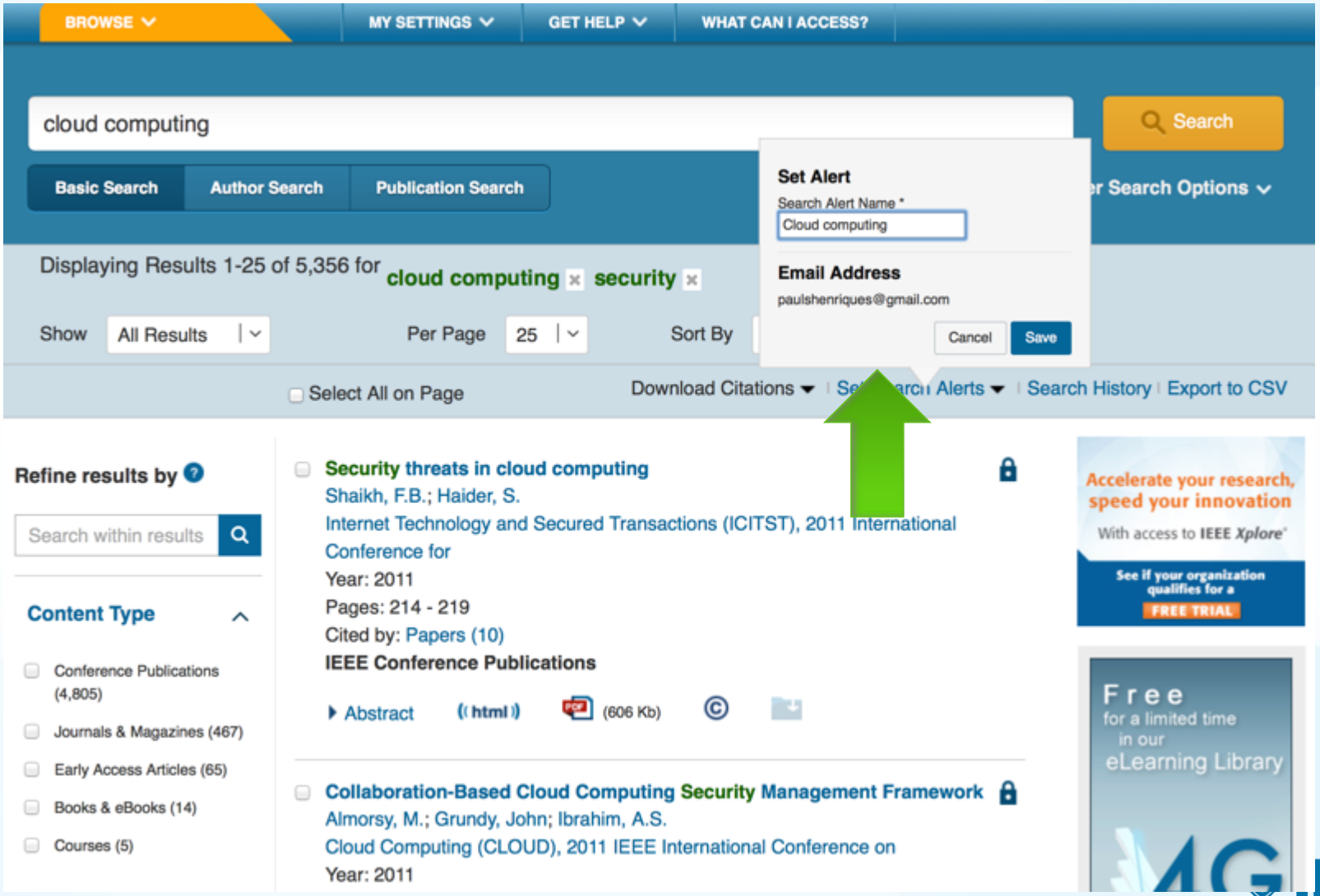
Features to save IEEE content:

- Download citation to build a bibliography
- Export Results into a multi field CSV download. Limit of 2000 records
- Saved Searches/Set Alert (IEEE Personal Account). Search is run every Friday. Limit of 15 searches
- Export to IEEE Collabratec

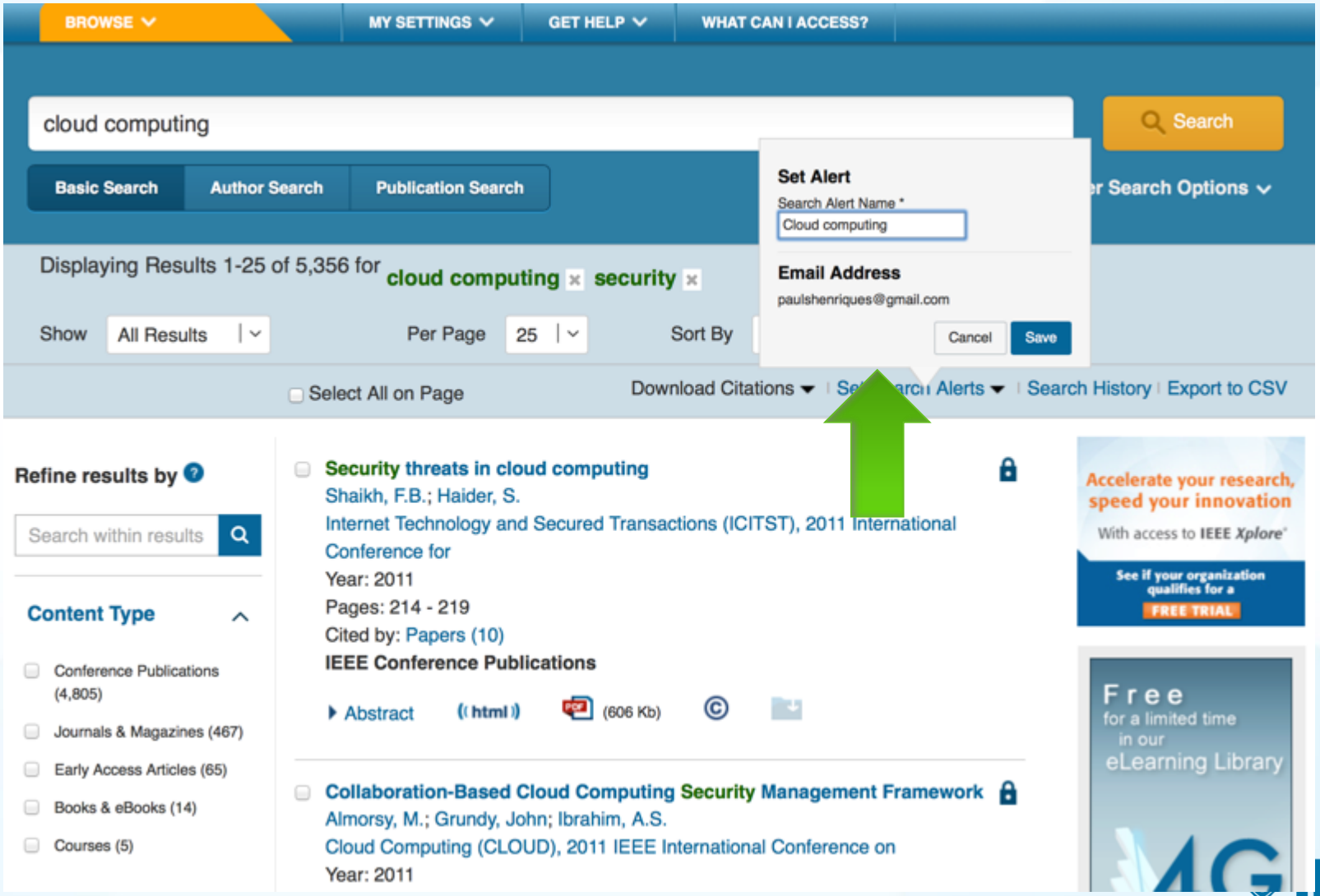
IEEE *Xplore* Demonstration

- **Alerts**
  - Stay up to date on the latest trends, competitor activity, etc.
  - Show a screenshot of an alert relevant to the prospect's area of research
- **Browse**
  - Highlight relevant conferences, journals, and standards
  - Users can identify subject matter experts by using the eLearning module and then search for additional papers that they've written in *Xplore*

Saved Searches/Table of Content Alerts



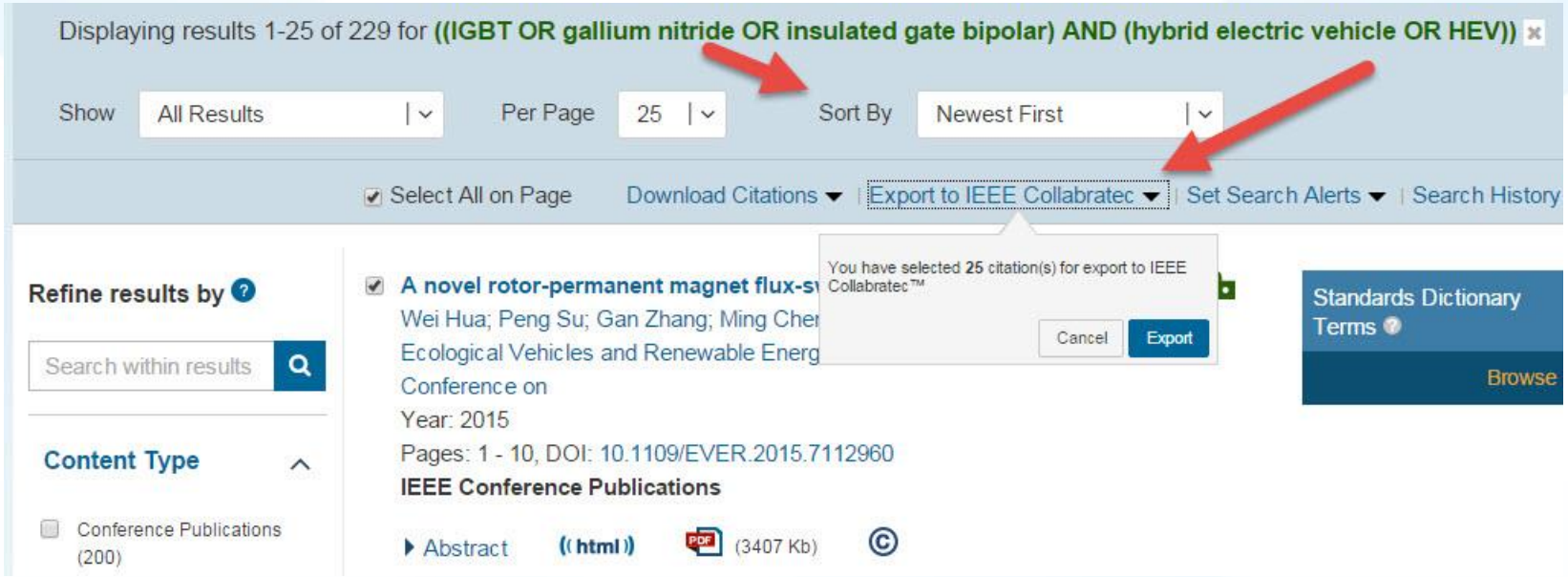
Saved Searches/Table of Content Alerts



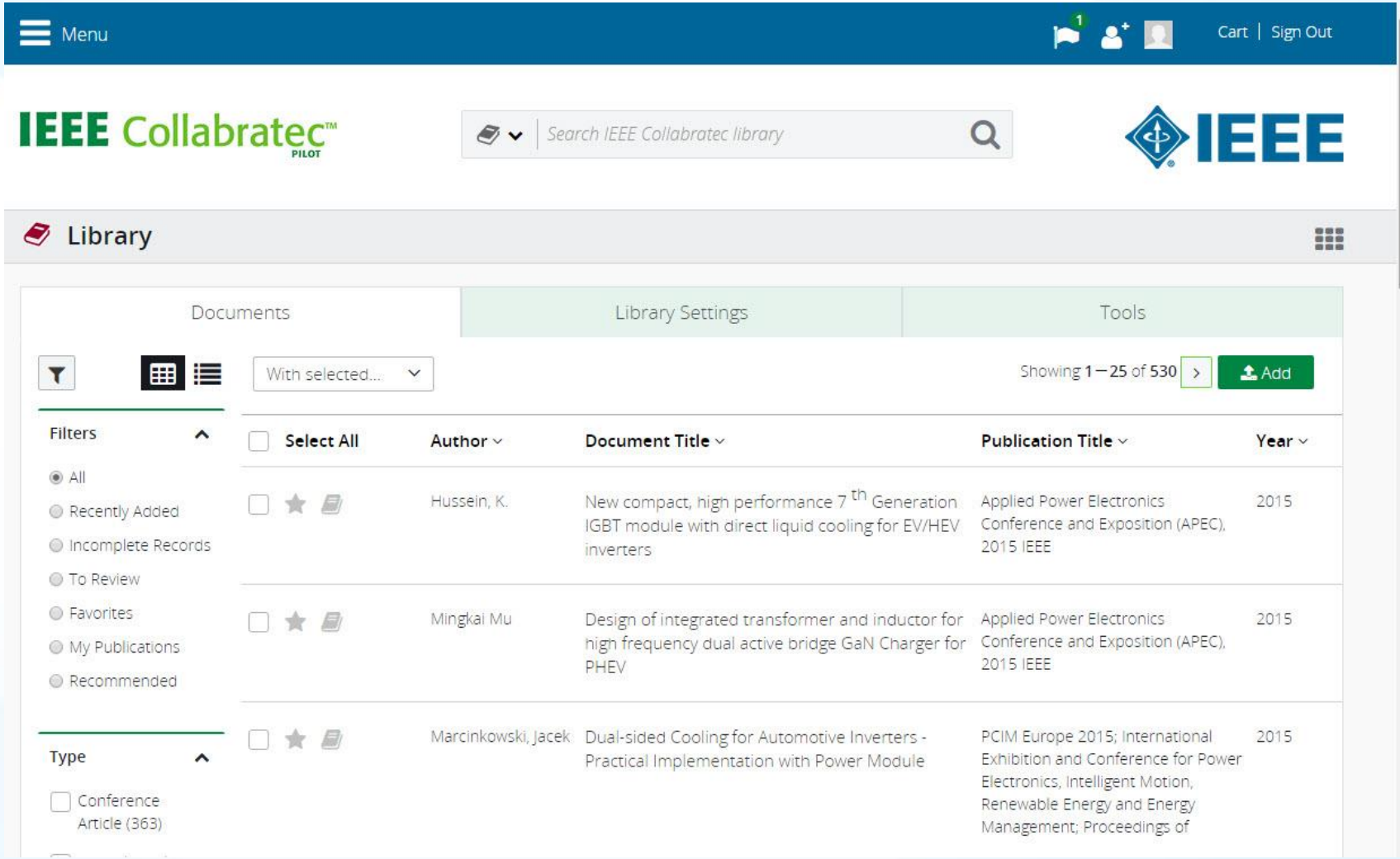
Saved Searches: Tips

- Users can save any search from the search results page
- Access Saved Searches from the My Settings drop-down menu
- Each user can save up to 15 searches
- Broad searches work best
- Any refinements made on the search results page will be included in the saved searches
- Do not use the publication date field or facet (or the saved search will expire at the end of the year)
- Users will receive an email once a week with a link to any new content added to *Xplore* that meets their search criteria

Organize Your Research with IEEE Collabratec



Export Documents to Collabratec



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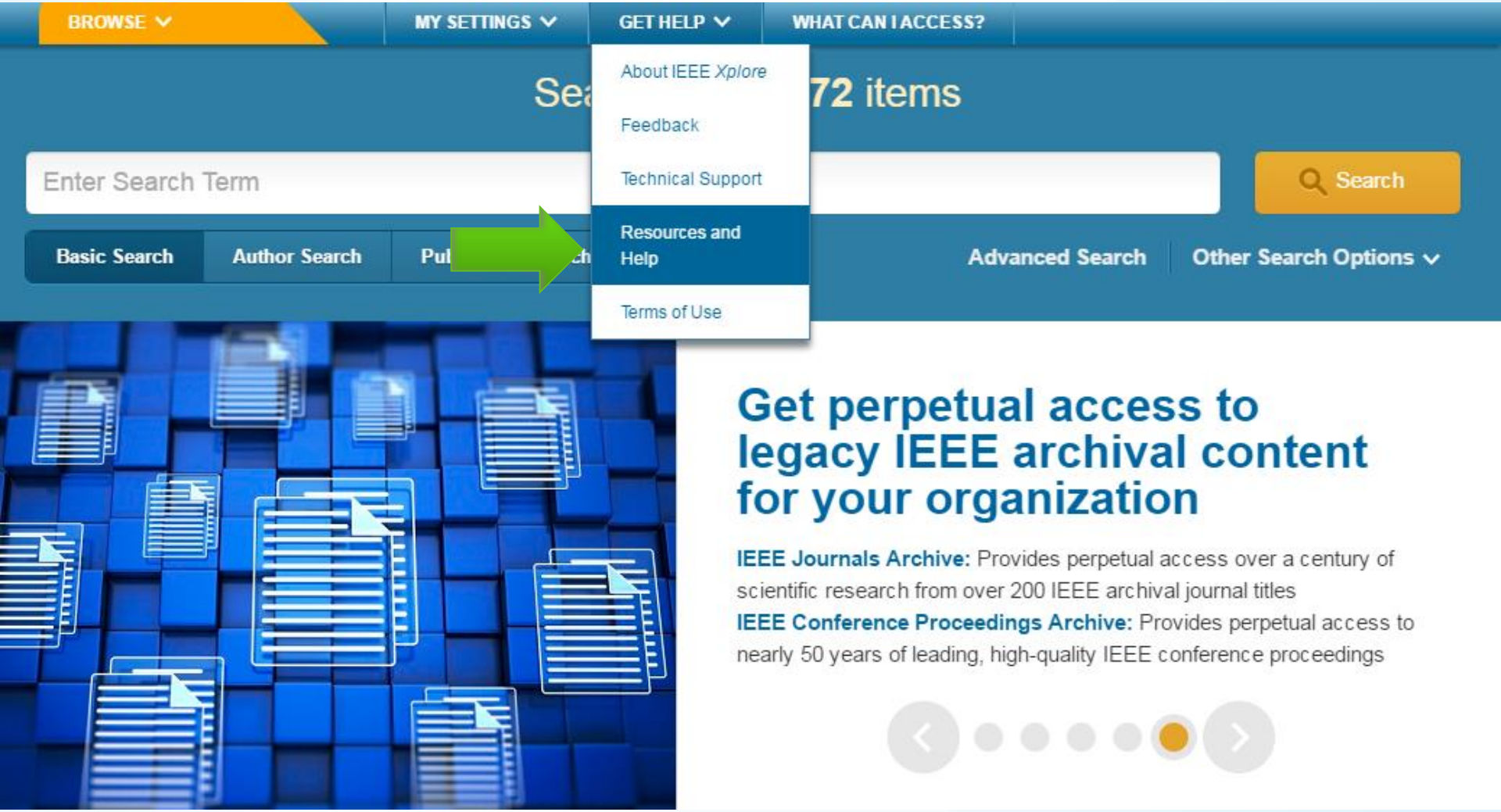
Resources and Help Section



Resources and Help

Resources and Help

- About IEEE *Xplore*
- Tutorials & Training
- Personalization Settings
- Browsing IEEE *Xplore*
- Searching IEEE *Xplore*
- Subscriptions & Access
- Administrators & Librarians
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- Submitting Manuscript

New Features

- » Citation Alerts
- » Blended Abstract & Full Text HTML
- » Secondary Author Affiliation
- » ORCID Author ID

Popular Topics

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- » Search History
- » Advanced Search
- » Setting Search Preferences

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- » Request an Institutional Administration Account
- » Usage Reports

Researchers

- » Content Alerts
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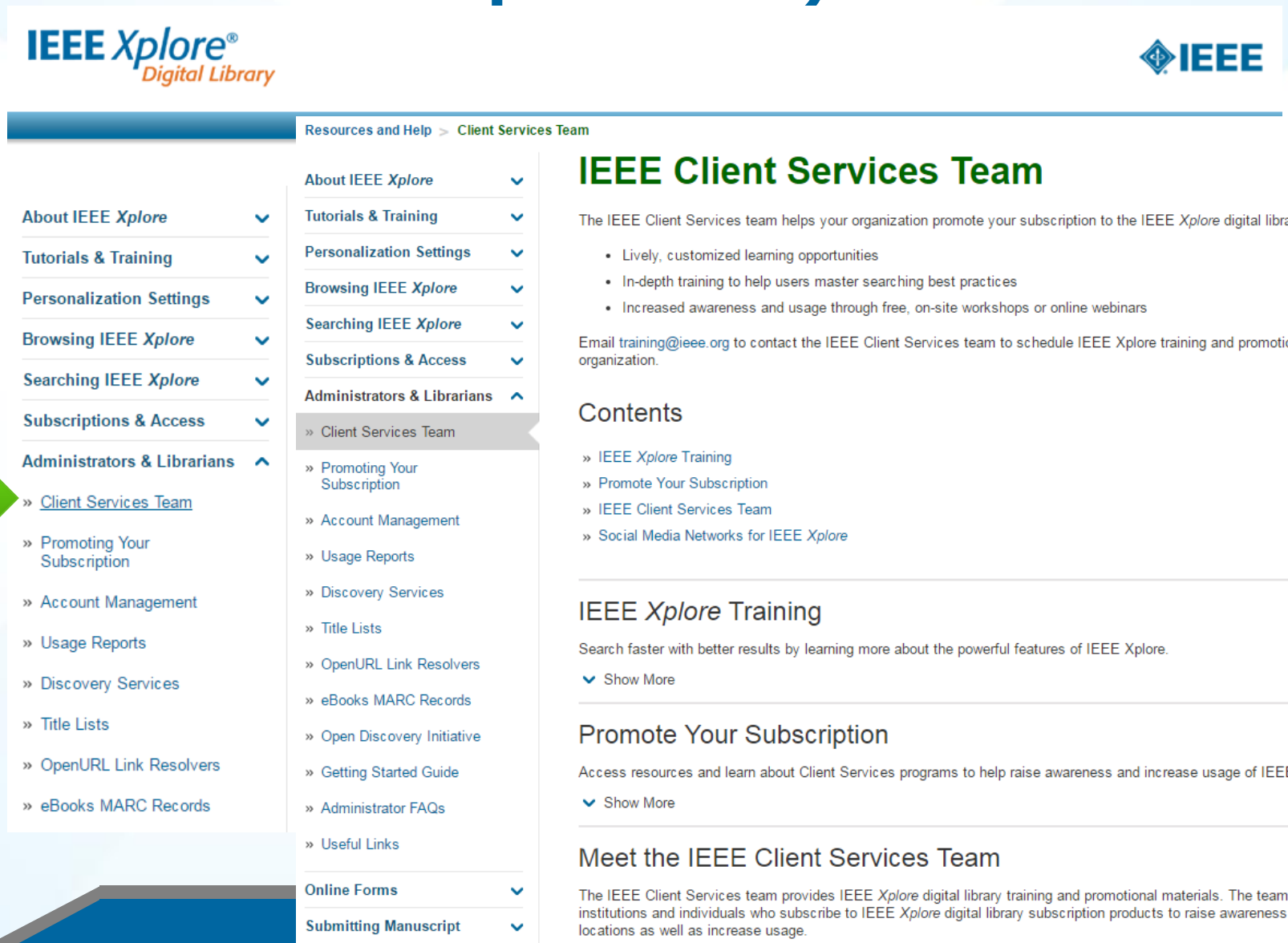

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An X-band gigawatt amplifier

E. B. Abubakirov; A. N. Denisenko; M. I. Fuks; N. G. Kolganov; N. F. Kovalev; M. I. Petelin; A. V. Savelyev; E. Schamiloglu; E. I. Soluyanov; V. V. Yastrebov

IEEE Transactions on Plasma Science

Year: 2002, Volume: 30, Issue: 3

Pages: 1041 - 1052, DOI: 10.1109/TPS.2002.801601

Cited by: Papers (27)

IEEE Journals & Magazines

Abstract (html) (862 Kb)

High-power UV light generation in picosecond pulse trains

Mikhail Martyanov; Marta Divall; Ekaterina Gacheva; Christoph Hessler; Valentin Fedosseev

2013 Conference on Lasers & Electro-Optics Europe & International Quantum Electronics Conference CLEO EUROPE/IQEC

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Pages: 1 - 1, DOI: 10.1109/CLEOE-IQEC.2013.6800883

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- Aims & Scope

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- Innovative phased array antennas based on non-regnlar lattices and overlapped subarrays [call for papers]

- Special Issue on Manipulation, Manufacturing and Measurement on the Nanoscale

2.718	0.04492	1.538
Impact Factor	Eigenfactor	Article Influence Score

Aims & Scope

The theory, design and application of Control Systems. It shall encompass components, and the integration of these components, as are necessary for the construction of such systems. The word `systems' as used herein shall be interpreted to include physical, biological, organizational and other entities and combinations thereof, which can be represented through a mathematical symbolism. The Field of Interest: shall include scientific, technical, industrial or other activities that contribute to this field,or utilize the techniques or products of this field, subject, as the art develops, to additions, subtractions, or other modifications directed or approved by the IEEE Technical Activities Board.

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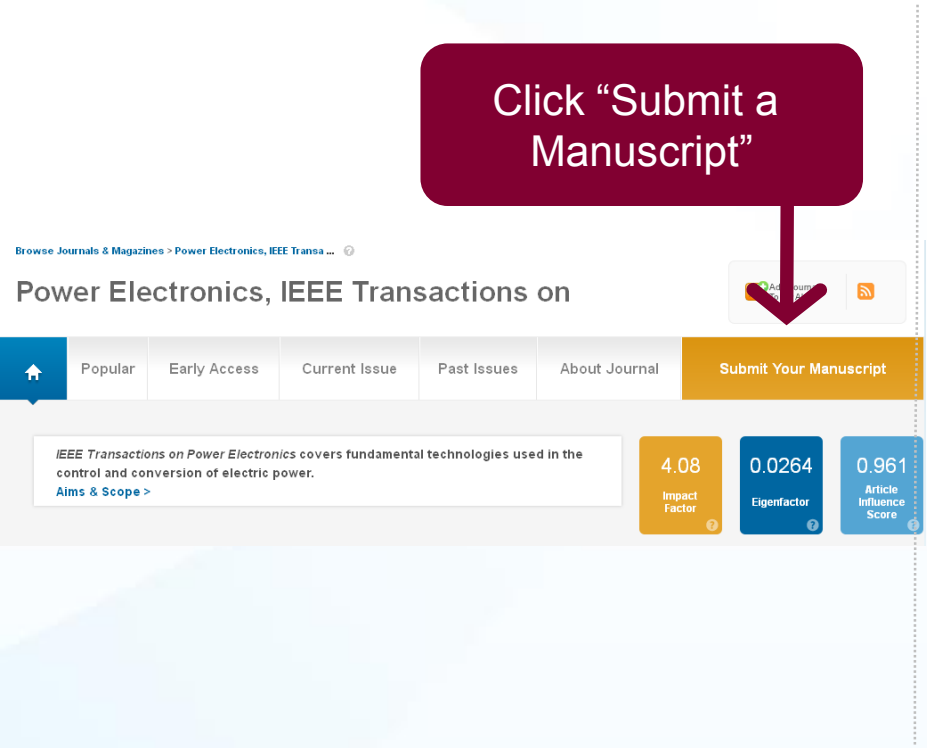

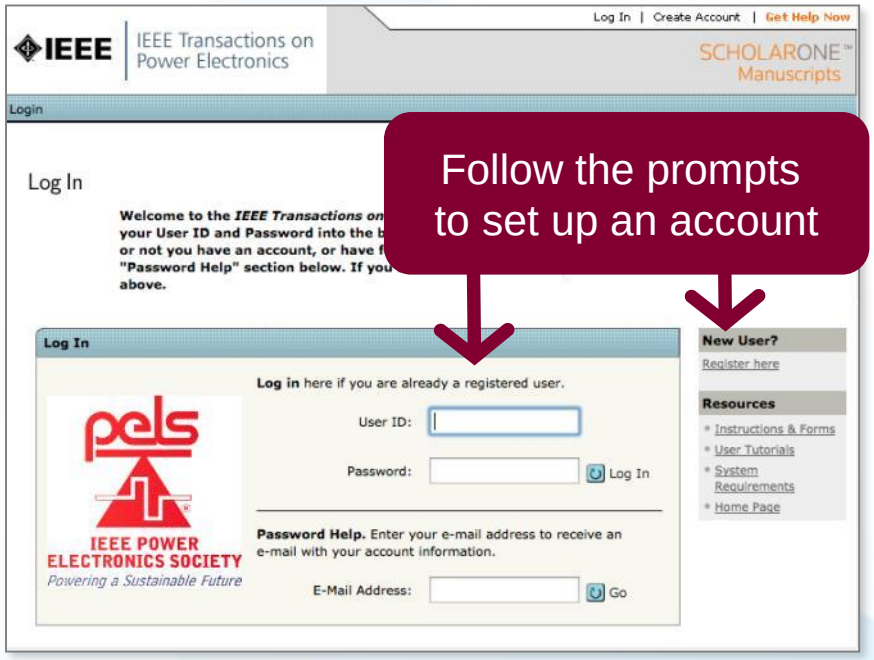

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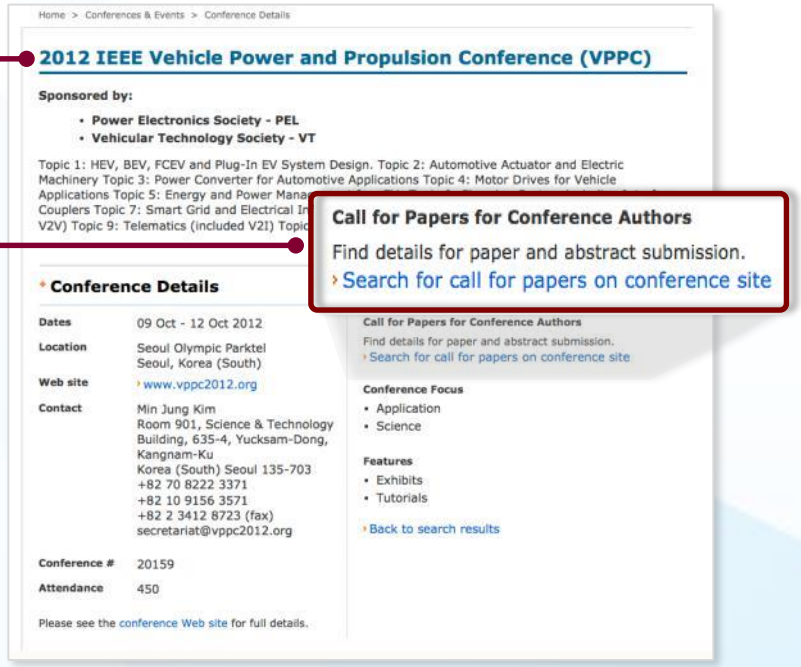

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2018 IEEE Symposium on Security and Privacy (SP) Full Paper Submission deadline: 16 Nov 2017 Final submission deadline: 31 Mar 2018 Notification of acceptance date: 11 Feb 2018	20 May - 24 May 2018	Hyatt Regency San Francisco 5 Embarcadero Center San Francisco, CA, USA

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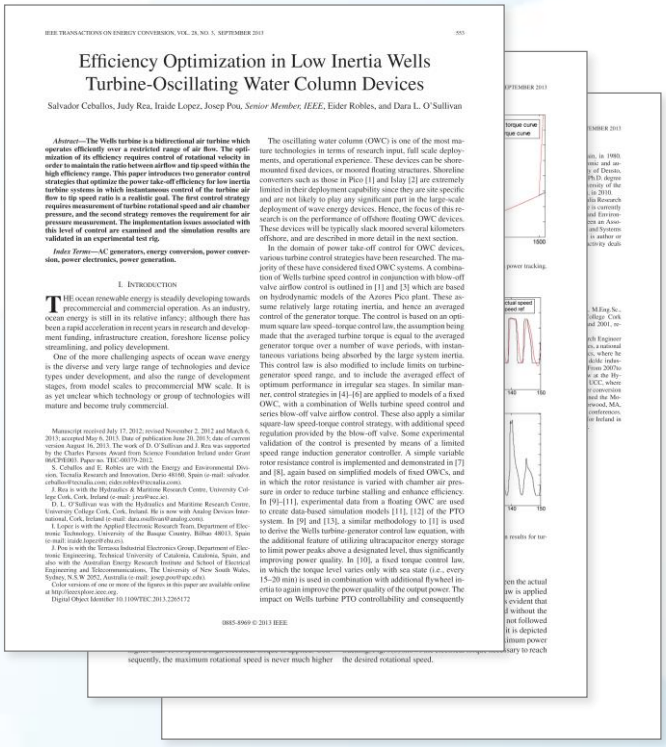
Structure

Paper Structure

Elements of a manuscript

- Title
- Abstract
- Keywords
- Introduction
- Methodology
- Results/Discussions/Findings
- Conclusion
- References



IEEE TRANSACTIONS ON ENERGY CONVERSION, VOL. 28, NO. 3, SEPTEMBER 2013 555

Efficiency Optimization in Low Inertia Wells Turbine-Oscillating Water Column Devices

Salvador Ceballos, Judy Rea, Iraide Lopez, Josep Pou, *Senior Member, IEEE*, Eider Robles, and Dara L. O'Sullivan

Abstract—**The Wells turbine is a bidirectional air turbine which operates efficiently over a restricted range of air flow. The optimization of its efficiency requires control of rotational velocity in order to maintain the ratio between airflow and tip-speed within the high efficiency range. This paper introduces two generator control strategies that optimize the power take-off efficiency for low inertia turbine systems in which instantaneous control of the turbine air flow to tip speed ratio is a realistic goal. The first control strategy requires measurement of turbine rotational speed and air chamber pressure, and the second strategy removes the requirement for air pressure measurement. The implementation issues associated with this level of control are examined and the simulation results are validated in an experimental test rig.**

Index Terms—**AC generators, energy conversion, power conversion, power electronics, power generation.**

I. Introduction

THE ocean renewable energy is steadily developing towards precommercial and commercial operation. As an industry, ocean energy is still in its relative infancy; although there has been a rapid acceleration in recent years in research and development funding, infrastructure creation, foreshore license policy streamlining, and policy development.

One of the more challenging aspects of ocean wave energy is the diverse and very large range of technologies and device types under development, and also the range of development stages, from model scales to precommercial MW scale. It is as yet unclear which technology or group of technologies will mature and become truly commercial.

The oscillating water column (OWC) is one of the most mature technologies in terms of research input, full scale deployments, and operational experience. These devices can be shore-mounted fixed devices, or moored floating structures. Shoreline converters such as those in Pico [1] and Islay [2] are extremely limited in their deployment capability since they are site specific and are not likely to play any significant part in the large-scale deployment of wave energy devices. Hence, the focus of this research is on the performance of offshore floating OWC devices. These devices will be typically slack moored several kilometers offshore, and are described in more detail in the next section.

In the domain of power take-off control for OWC devices, various turbine control strategies have been researched. The majority of these have considered fixed OWC systems. A combination of Wells-turbine speed control in conjunction with blow-off valve airflow control is outlined in [1] and [3] which are based on hydrodynamic models of the Azores Pico plant. These assume relatively large rotating inertia, and hence an averaged control of the generator torque. The control is based on an optimum square law speed–torque control law, the assumption being made that the averaged turbine torque is equal to the averaged generator torque over a number of wave periods, with instantaneous variations being absorbed by the large system inertia. This control law is also modified to include limits on turbine-generator speed range, and to include the averaged effect of optimum performance in irregular sea stages. In similar manner, control strategies in [4]–[6] are applied to models of a fixed OWC, with a combination of Wells turbine speed control and series blow-off valve airflow control. These also apply a similar square-law speed-torque control strategy, with additional speed regulation provided by the blow-off valve. Some experimental validation of the control is presented by means of a limited speed range induction generator controller. A simple variable rotor resistance control is implemented and demonstrated in [7] and [8], again based on simplified models of fixed OWCs, and in which the rotor resistance is varied with chamber air pressure in order to reduce turbine stalling and enhance efficiency. In [9]–[11], experimental data from a floating OWC are used to create data-based simulation models [11], [12] of the PTO system. In [9] and [13], a similar methodology to [1] is used to derive the Wells turbine-generator control law equation, with the additional feature of utilizing ultracapacitor energy storage to limit power peaks above a designated level, thus significantly improving power quality. In [10], a fixed torque control law, in which the torque level varies only with sea state (i.e., every 15–20 min) is used in combination with additional flywheel inertia to again improve the power quality of the output power. The impact on Wells turbine PTO controllability and consequently

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D. L. O'Sullivan was with the Hydraulics and Maritime Research Centre, University College Cork, Cork, Ireland. He is now with Analog Devices International, Cork, Ireland (e-mail: dara.osullivan@analog.com).

I. Lopez is with the Applied Electronic Research Team, Department of Electronic Technology, University of the Basque Country, Bilbao 48013, Spain (e-mail: iraide.lopez@ehu.es).

J. Pou is with the Terrasea Industrial Electronics Group, Department of Electronic Engineering, Technical University of Catalonia, Catalonia, Spain, and also with the Australian Energy Research Institute and School of Electrical Engineering and Telecommunications, The University of New South Wales, Sydney, N.S.W 2052, Australia (e-mail: josep.pou@upc.edu).

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sequently, the maximum rotational speed is never much higher than the desired rotational speed.

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Paper Structure

Title

An effective title should…

- Answer the reader's question: *"Is this article relevant to me?"*
- Grab the reader's attention
- Describe the content of a paper using the fewest possible words
  - Is crisp, concise
  - Uses keywords
  - Avoids jargon

Paper Structure

Good vs. Bad Title

A Human Expert-based Approach to Electrical Peak Demand Management

vs

A better approach of managing environmental and energy sustainability via a study of different methods of electric load forecasting

Paper Structure

Good vs. Better Title

An Investigation into the Effects of Residential Air-Conditioning Maintenance in Reducing the Demand for Electrical Energy

vs

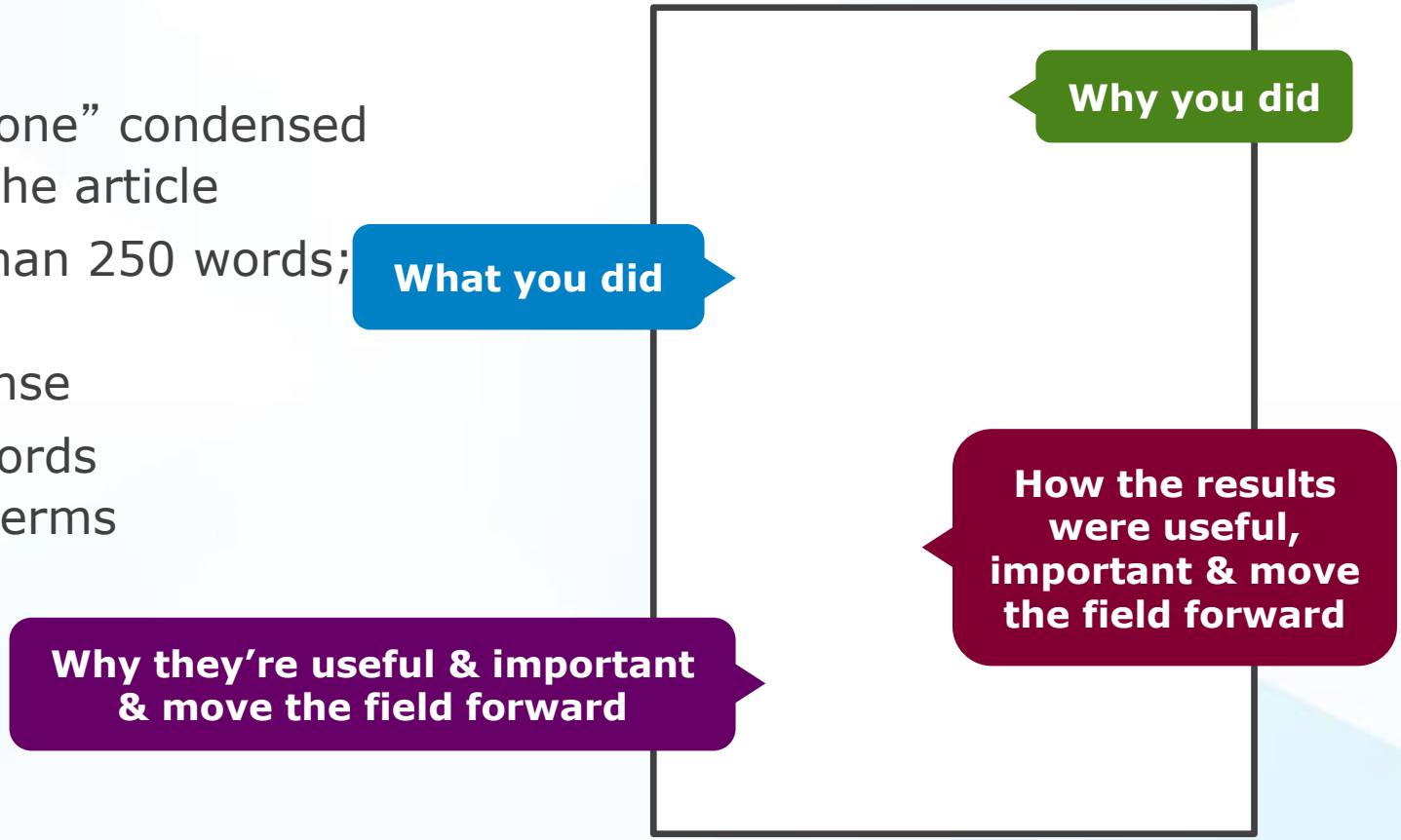
"Role of Air-Conditioning Maintenance on Electric Power Demand"

Paper Structure

Abstract

A “stand alone” condensed version of the article

- No more than 250 words; written in the past tense
- Uses keywords and index terms



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2) Between **150-250 words**. Be sure that you adhere to these limits; otherwise, you will need to edit your abstract accordingly.

3) Written as **one paragraph**, and should **not contain** displayed **mathematical equations or tabular material**.

4) Should include **three or four different keywords or phrases**, as this will help readers to find it. It is important to avoid over-repetition of such phrases as this can result in a page being rejected by search engines.

5) Ensure that your abstract **reads well and is grammatically correct**.

Paper Structure

Good vs. Bad Abstract

The objective of this paper was to propose a human expert-based approach to electrical peak demand management. The proposed approach helped to allocate demand curtailments (MW) among distribution substations (DS) or feeders in an electric utility service area based on requirements of the central load dispatch center. Demand curtailment allocation was quantified taking into account demand response (DR) potential and load curtailment priority of each DS, which can be determined using DS loading level, capacity of each DS, customer types (residential/commercial) and load categories (deployable, interruptible or critical). Analytic Hierarchy Process (AHP) was used to model a complex decision-making process according to both expert inputs and objective parameters. Simulation case studies were conducted to demonstrate how the proposed approach can be implemented to perform DR using real-world data from an electric utility. Simulation results demonstrated that the proposed approach is capable of achieving realistic demand curtailment allocations among different DSs to meet the peak load reduction requirements at the utility level.

Vs

This paper presents and assesses a framework for an engineering capstone design program. **We explain** how student preparation, project selection, and instructor mentorship are the three key elements that must be addressed before the capstone experience is ready for the students. **Next, we describe** a way to administer and execute the capstone design experience including design workshops and lead engineers. **We describe the importance** in assessing the capstone design experience and report recent assessment results of our framework. **We comment** specifically on what students thought were the most important aspects of their experience in engineering capstone design and provide quantitative insight into what parts of the framework are most important.

First person, present tense
No actual results, only describes the organization of the paper

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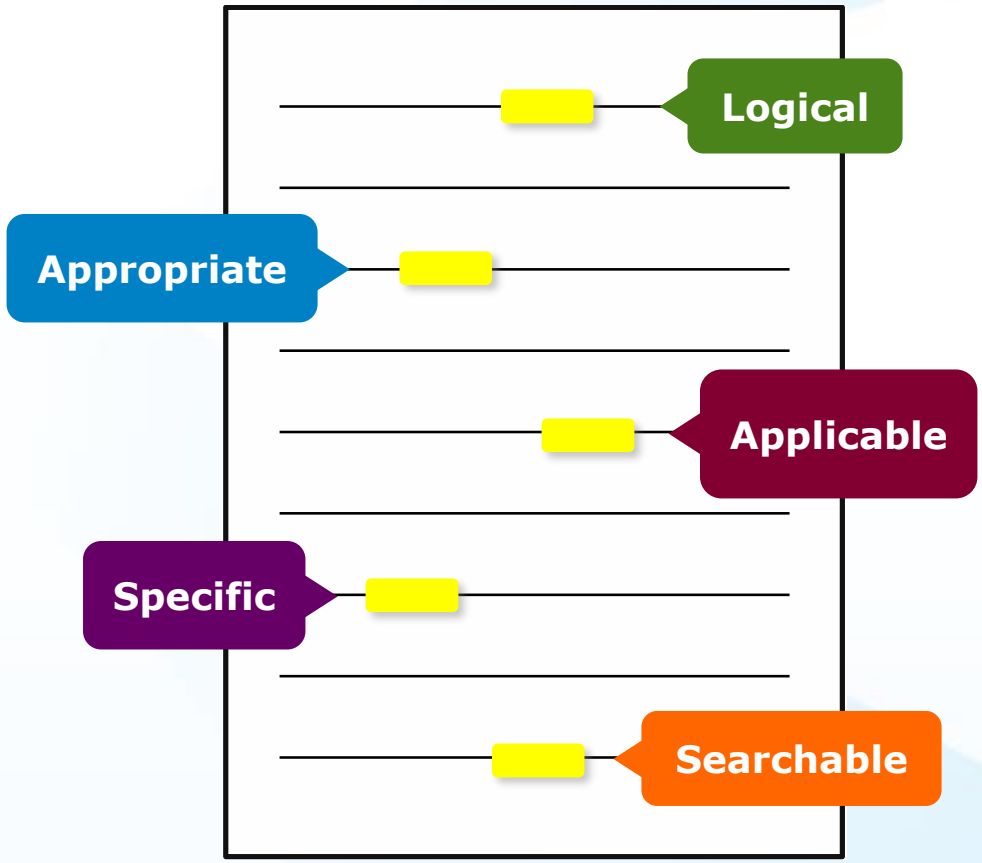
Paper Structure

Keywords

Use in the Title and Abstract for enhanced Search Engine Optimization



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IEEE Keywords

Bit rate, Decoding, Encoding, Parallel processing, Video coding

Authors Keywords

High Efficiency Video Coding (HEVC), parallel programming, video coding

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parallel processing, video coding

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12-core system, H.264-advanced video coding, HEVC parallelization approaches, OWF, WPP, frequency 3.33 GHz, high efficiency video coding, overlapped wavefront, parallel efficiency, parallel friendliness, parallel scalability, parallelization proposals, tiles, wavefront parallel processing

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Paper Structure

Introduction

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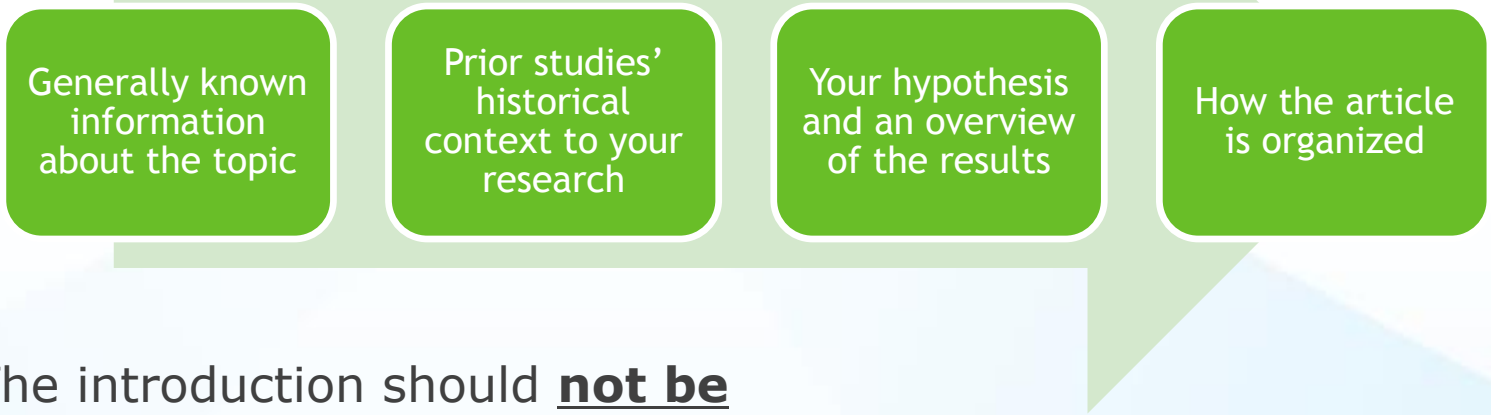

- The introduction should **not be**
  - Too broad or vague
  - More then 2 pages

Paper Structure

Methodology

- Problem formulation and the processes used to solve the problem, prove or disprove the hypothesis
- Use illustrations to clarify ideas, support conclusions:

Tables
Present representative data or when exact values are important to show

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Fig.1.

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Fig. 2.

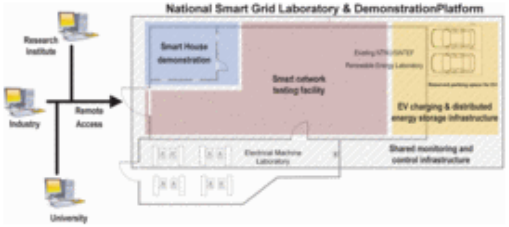

Fig. 3.

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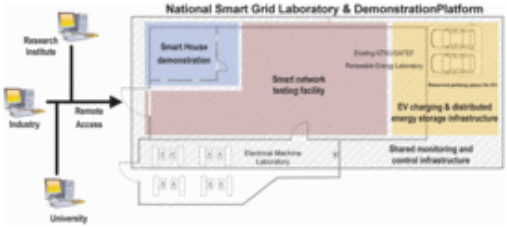
Fig. 2.



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Equations: Copy Source Code

The Test Case Prioritization Problem.

Given: T , a test suite; PT , the set of permutations of T ; f , a function from PT to the real numbers.

Problem: Find $T' \in PT$ such that

$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') > (T'')]$$

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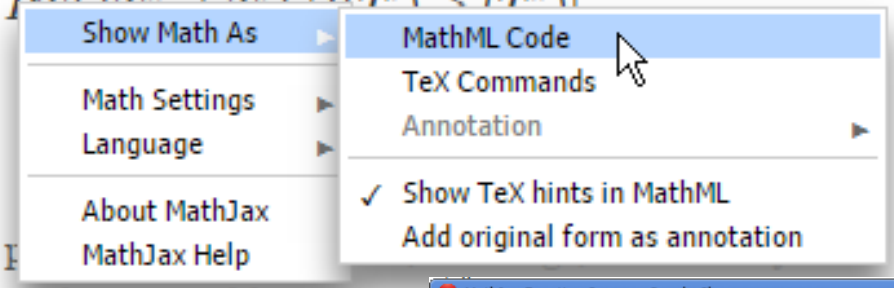
Here, PT represents the set of all p

function that, applied to any such ordering, yields an awar



Equations: Zoom Function

The Test Case Prioritization Problem.

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Problem: Find $T' \in PT$ such that

$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') \geq (T'')].$$

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Here, PT represents the set
function that, applied to any such ordering, yields an award value

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The Test Case Prioritization Problem.

Given: T , a test suite; PT , the set of permutations of T ; f , a function from PT to the real numbers.

$$(\forall\, T''\ (T'' \in PT)\ (T'' \neq T')\ [f(T') \geq (T'')].$$

View Source

Here, PT represents the set of all possible prioritizations (orderings) of T and f is a function that, applied to any such ordering, yields an award value for that ordering.

Paper Structure
Results/discussion

Demonstrate that you solved the problem or made significant advances

Results: Summarized Data

- Should be clear and concise
- Use figures or tables with narrative to illustrate findings

Discussion: Interprets the Results

- Why your research offers a new solution
- Acknowledge any limitations

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Paper Structure

Conclusion

- Explain what the research has achieved
  - As it relates to the problem stated in the Introduction
  - Revisit the key points in each section
  - Include a summary of the main findings, important conclusions and implications for the field
- Provide benefits and shortcomings of:
  - The solution presented
  - Your research and methodology
- Suggest future areas for research

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Paper Structure
References

- **Support and validate the hypothesis your research proves, disproves or resolves**
- There is no limit to the number of references
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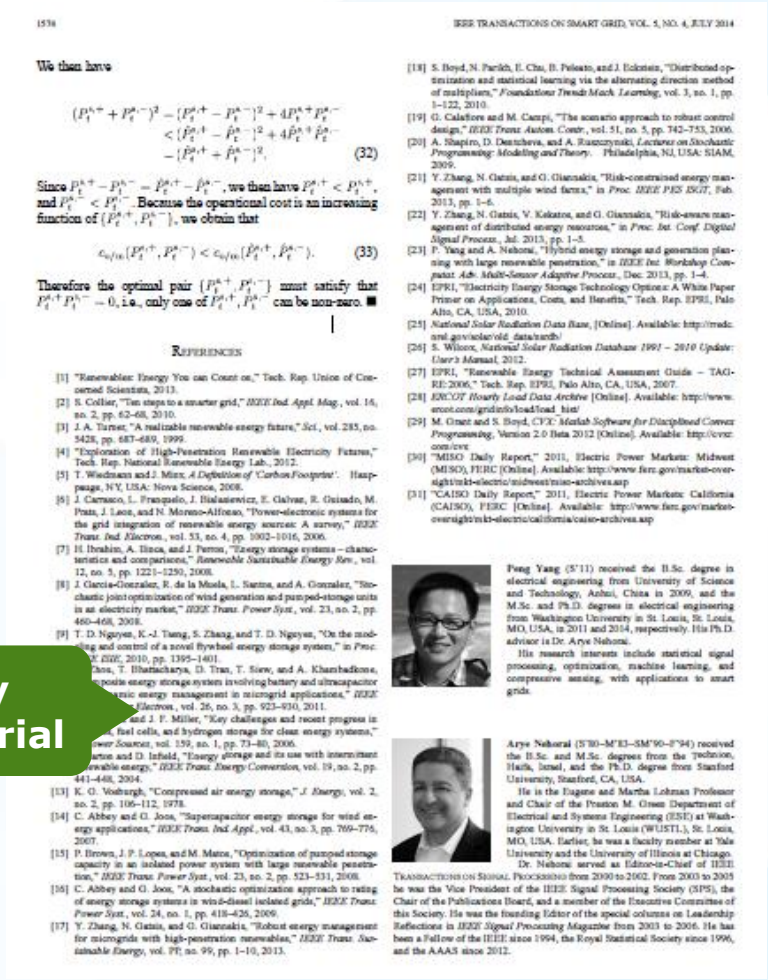

1536 IEEE TRANSACTIONS ON SMART GRID, VOL. 5, NO. 4, JULY 2014

We then have

$$(P_t^{b+}+P_t^{s-})^2-(P_t^{s+}-P_t^{s-})^2+4P_t^{s+}P_t^{s-} < (\hat{P}_t^{b+}-\hat{P}_t^{s-})^2+4\hat{P}_t^{s+}\hat{P}_t^{s-} -(\hat{P}_t^{s+}+\hat{P}_t^{s-})^2. \quad (32)$$

Since $P_t^{b+}-P_t^{s-}=\hat{P}_t^{s+}-\hat{P}_t^{s-}$, we then have $P_t^{s+}<P_t^{b+}$, and $P_t^{s-}<\hat{P}_t^{s-}$. Because the operational cost is an increasing function of $\{P_t^{s+},P_t^{s-}\}$, we obtain that

$$c_{op/m}(P_t^{s+},P_t^{s-})<c_{op/m}(\hat{P}_t^{s+},\hat{P}_t^{s-}). \quad (33)$$

Therefore the optimal pair $\{P_t^{s+},P_t^{s-}\}$ must satisfy that $P_t^{s+}P_t^{s-}=0$, i.e., only one of P_t^{s+}, P_t^{s-} can be non-zero. ■

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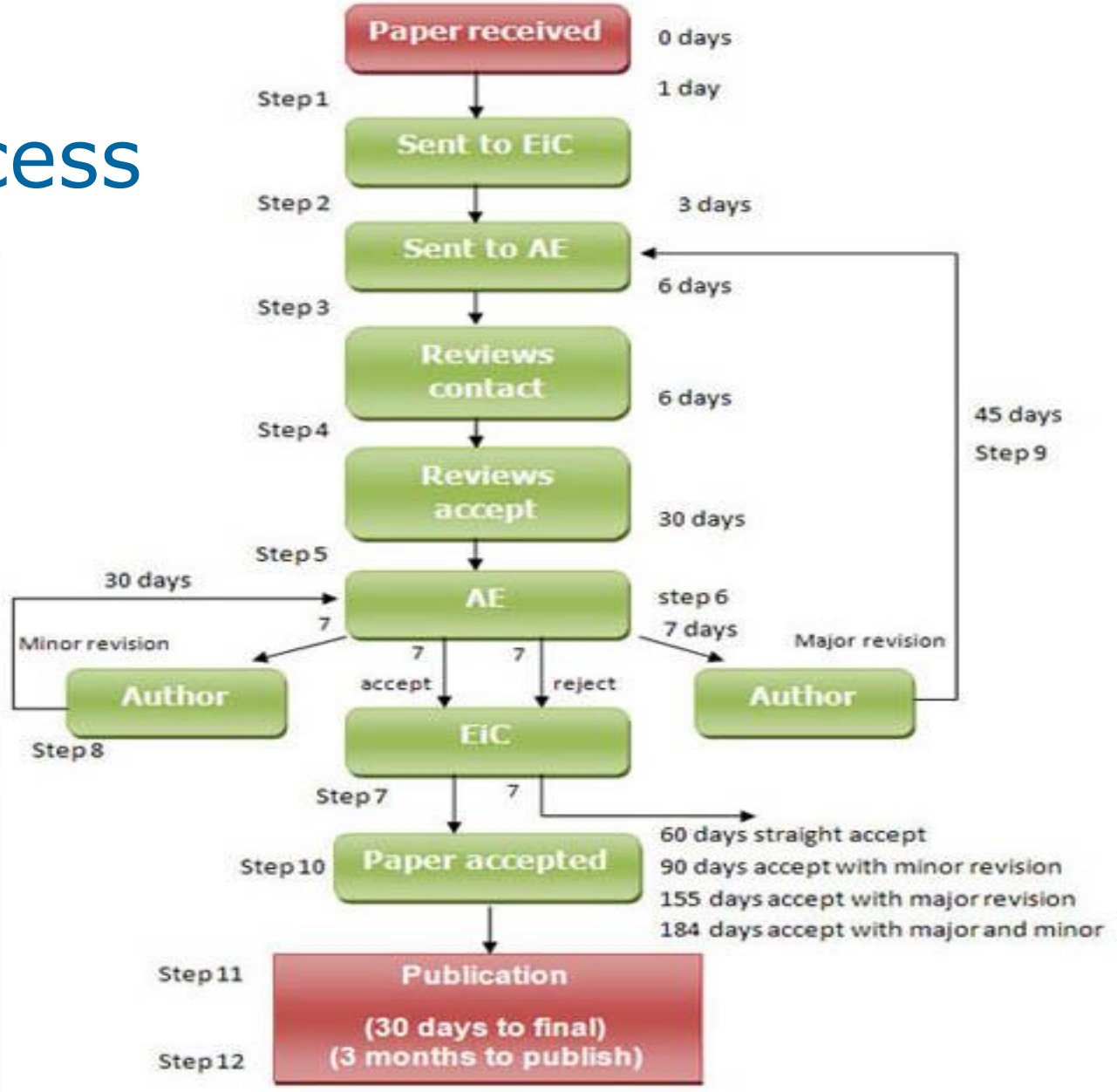

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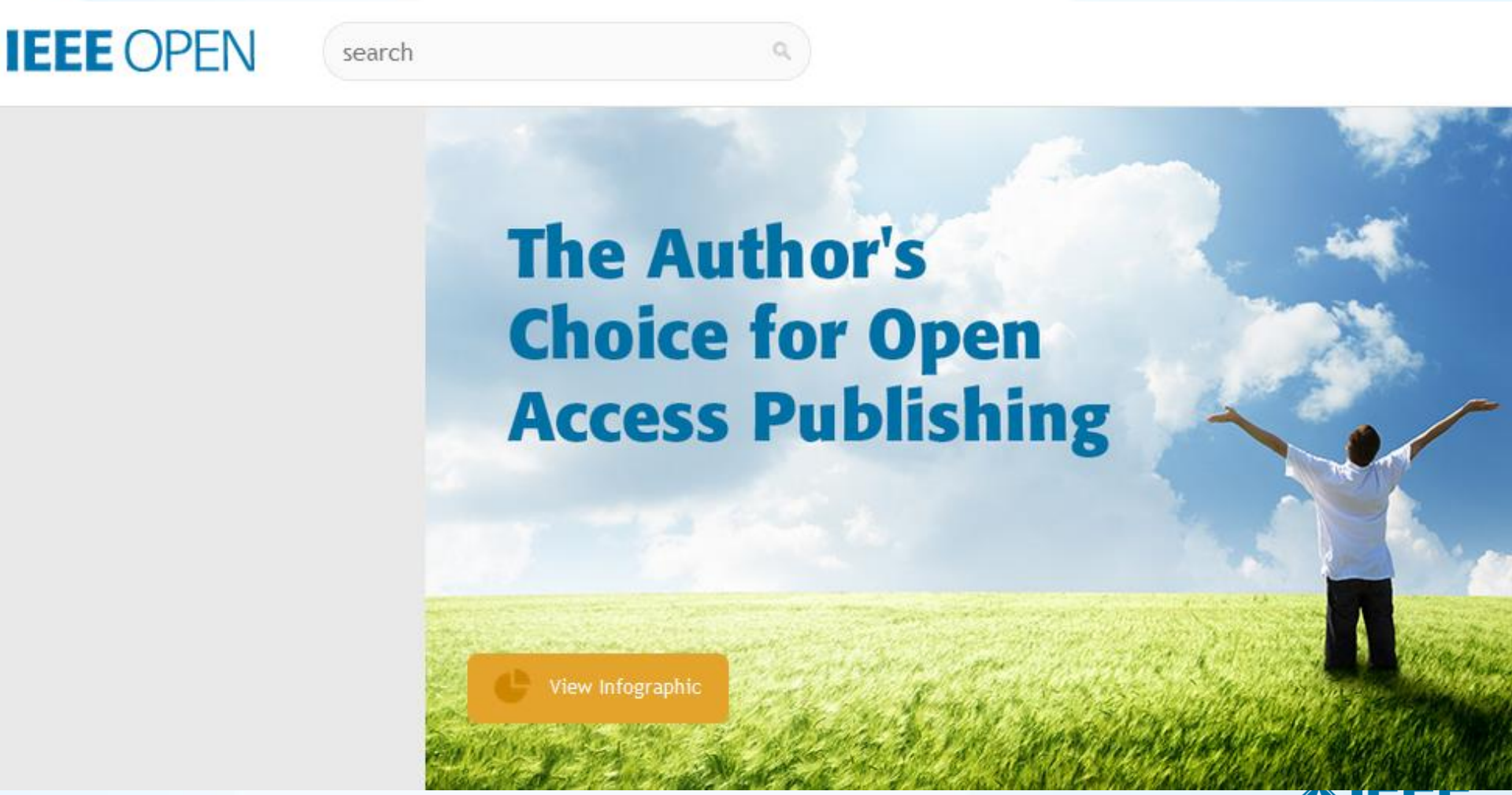

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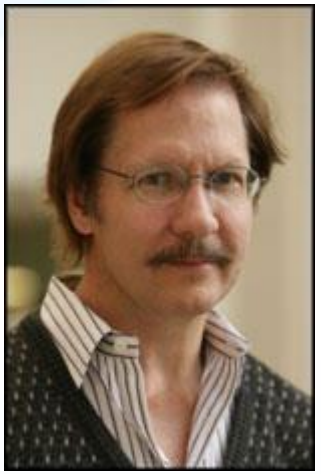

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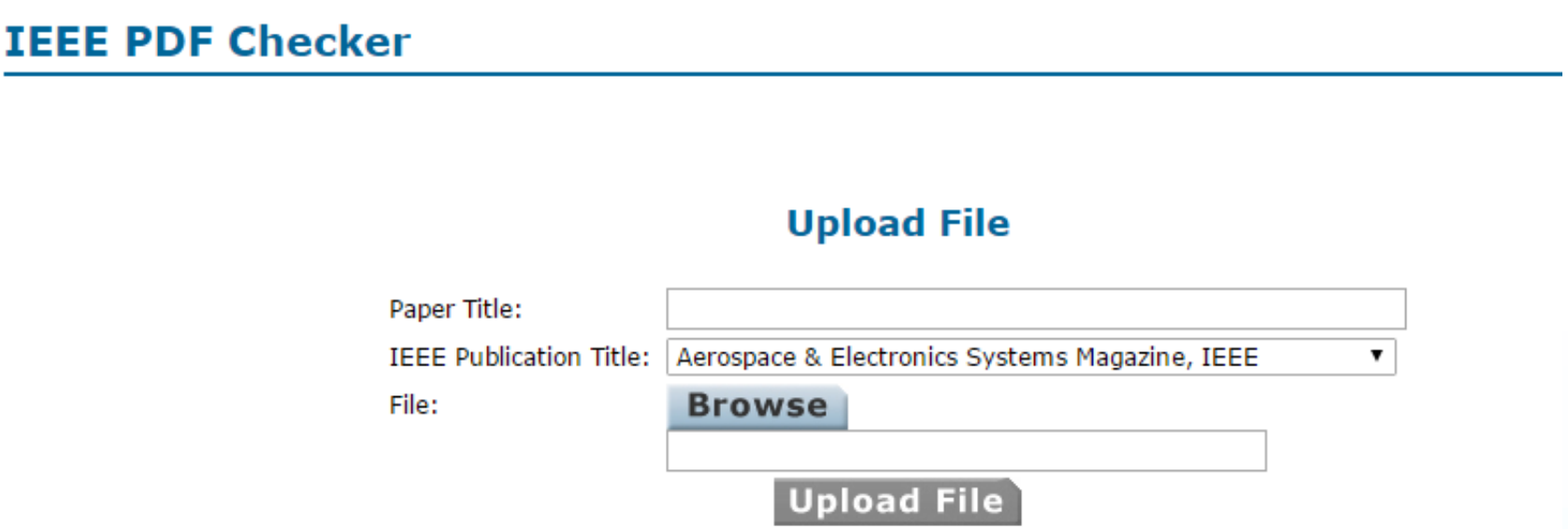

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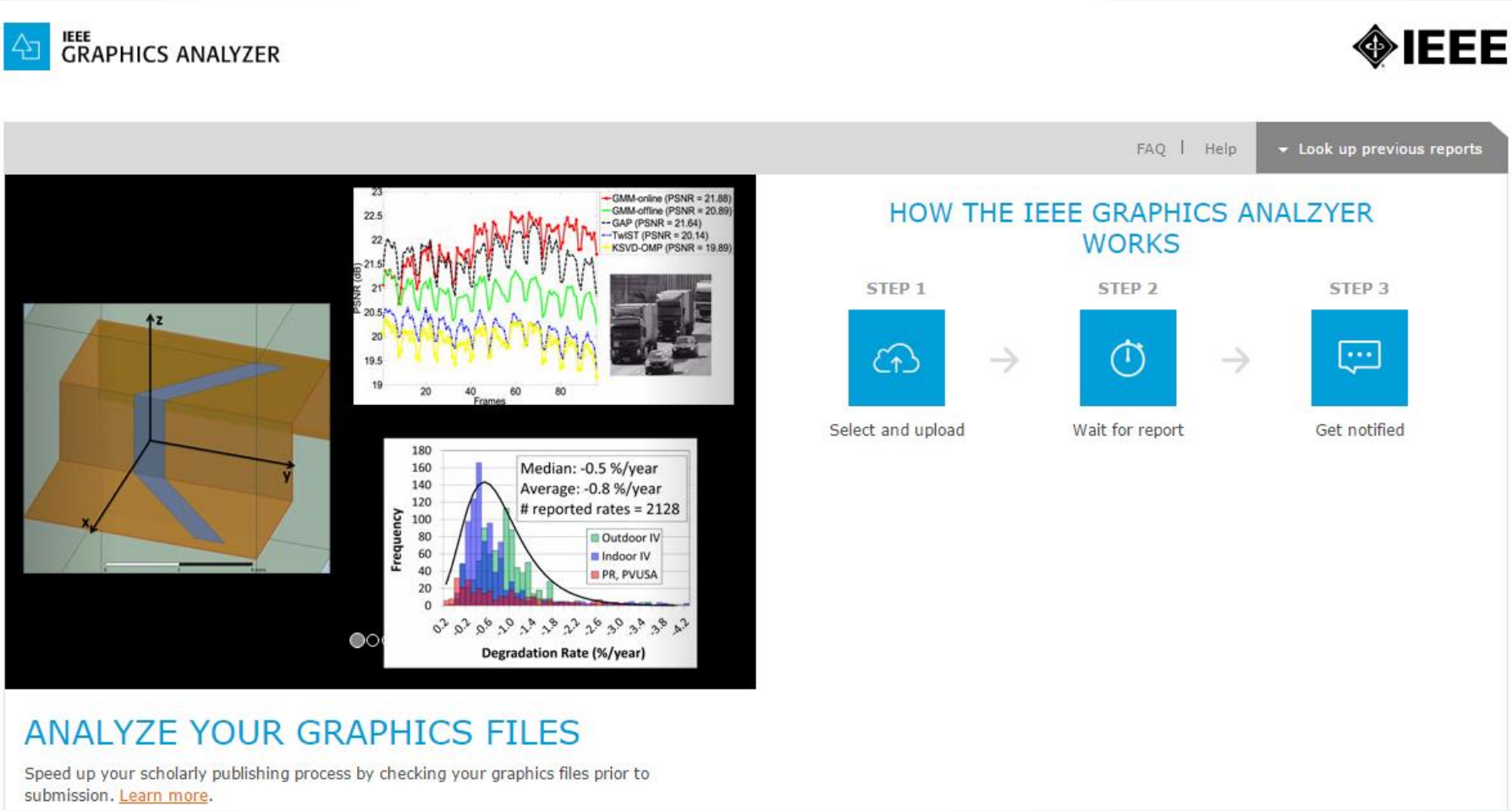

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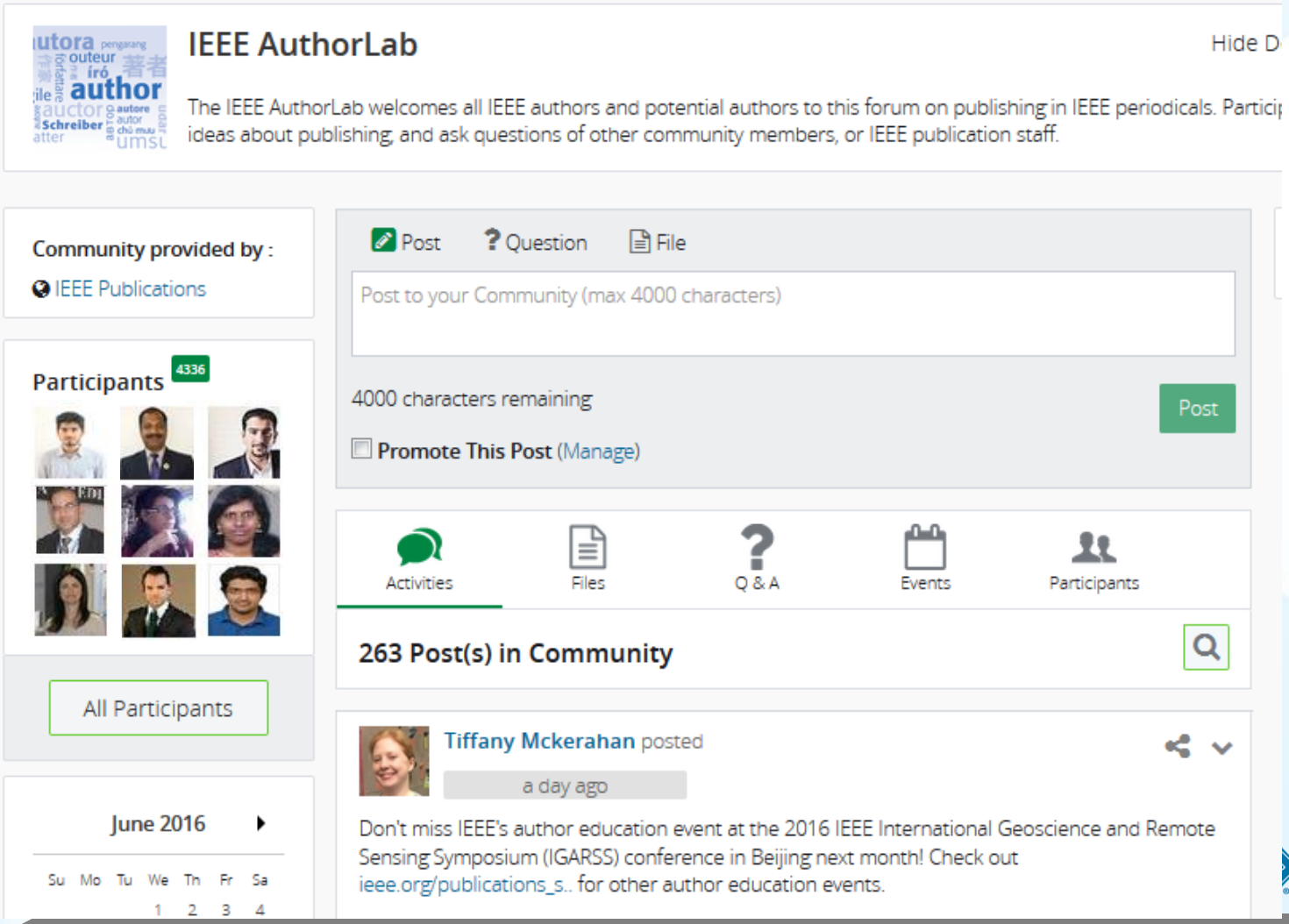

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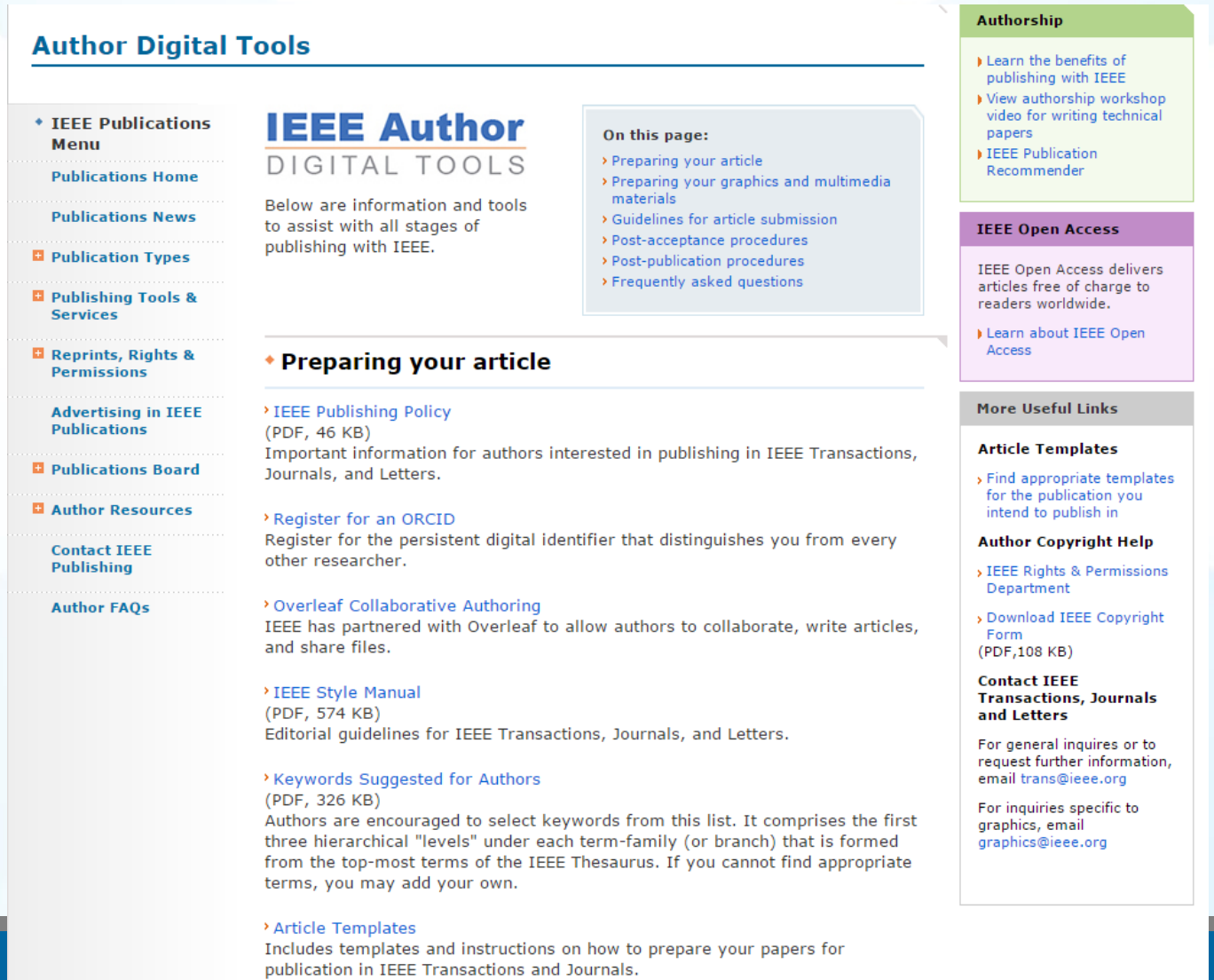

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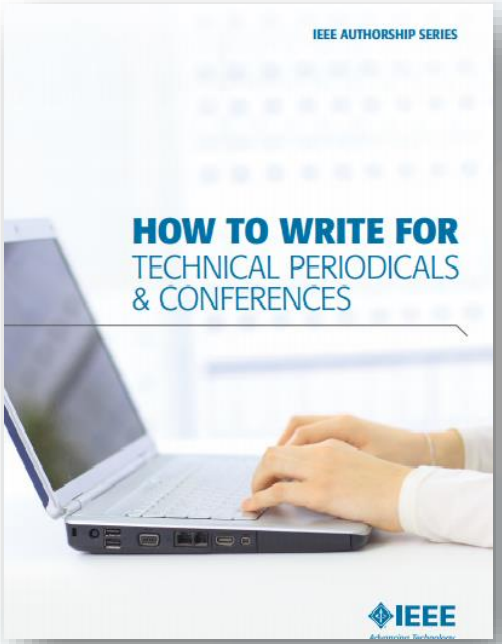

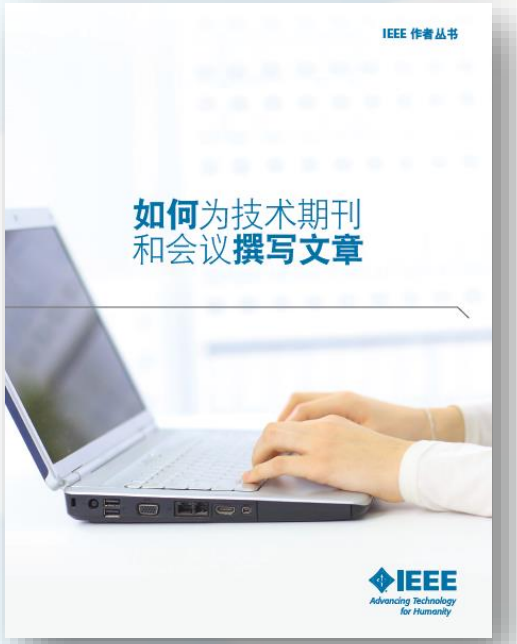

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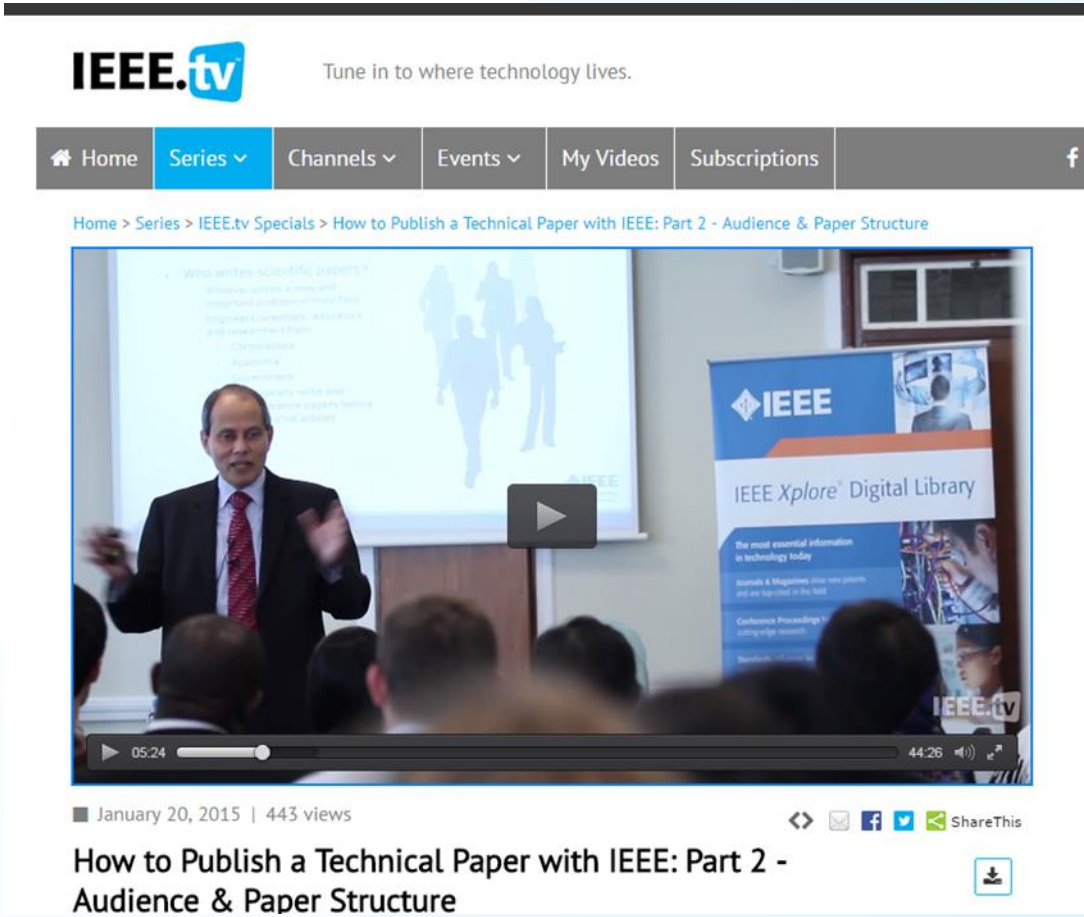

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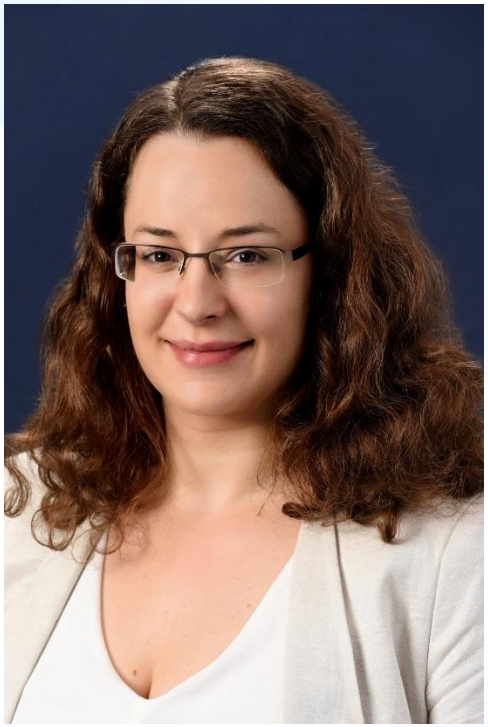

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