How to Write and Publish Research Papers for the Premier Forums in Knowledge & Data Engineering

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Technical Interests: Deduction ➔ Induction

Expert System Technology, by Xindong Wu & Yan Zou

Constructing Expert Systems, by Xindong Wu

Knowledge Acquisition from Databases, by Xindong Wu

Knowledge Discovery in Multiple Databases

Expert Systems  Expert Systems  数据挖掘  数据挖掘
**Big Data Characteristics: HACE Theorem**

*HACE Theorem:*
a theorem to model Big Data characteristics

*Summarizing* the key challenges for Big Data mining

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Xindong Wu, Xinquan Zhu, Gongqing Wu, Wei Ding. **Data Mining with Big Data.** *IEEE Transactions on Knowledge and Data Engineering (TKDE), 26*(2014), 1: 97-107.

No.1 most downloaded paper in IEEE XPLORE (all journals & conferences included since 1884) between Jan. ’14 and June ‘15 (18 consecutive months); No.2 in July ’15; No.3 in Aug ’15; No.4 in Sept ~ Dec ’15 (while #3 was always a 1948 paper).

Google Scholar Citations as of 6/24/16: 551
Contents

– Some TKDE and ICDM statistics
– Scientific writing and paper structure
– What to know and how to write a top-quality paper
  • A promising topic
  • A convincing case
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  • The most important part: the introduction
– How to publish at ICDM and TKDE
– Paper reviewing and its feedback
– Summary of take-home messages
Focused Areas in Knowledge & Data Engineering

- Data Mining
  - Knowledge Discovery in Databases (KDD)
  - Intelligent Data Analysis

- Database Systems
  - Data Management
  - Data Engineering

- Knowledge Engineering
  - Semantic Web
  - Knowledge-Based Systems
  - Soft Computing
Major Forums in Data Mining

- Conferences (conference publications are extremely important in Computer Science):
  - The birth of data mining/KDD: 1989 IJCAI Workshop on Knowledge Discovery in Databases
    - 1991-1994 Workshops on Knowledge Discovery in Databases
  - 1995 – date: ACM International Conferences on Knowledge Discovery in Databases and Data Mining (KDD)
  - 2001 – date: IEEE International Conference on Data Mining (ICDM) and SIAM-DM (SDM)
  - Several regional conferences, incl. PAKDD (since 1997) & PKDD (since 1997)

- Journals (top journals vs high-impact journals):
  - Data Mining and Knowledge Discovery (DMKD, since 1997, 2015 Impact Factor: 2.714)
  - Knowledge and Information Systems (KAIS, since 1999, 2015 Impact Factor: 1.702)
  - IEEE Transactions on Knowledge and Data Engineering (TKDE, 2015 IF 2.476)
  - ACM Trans. on Knowledge Discovery from Data (TKDD, since 2007, 2015 IF 1.000)
  - Many others, incl. TPAMI, JMLR, MLJ, IDA, …
ACM KDD vs. IEEE ICDM

KDD and ICDM Paper Submissions

# of Submissions

<table>
<thead>
<tr>
<th>Year</th>
<th>ACM SIGKDD</th>
<th>IEEE ICDM</th>
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<tr>
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<td>237</td>
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<tr>
<td>2011</td>
<td>714</td>
<td>786</td>
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## TKDE Submission Numbers and Acceptance Rates

<table>
<thead>
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<th>Year</th>
<th>New Submission #</th>
<th>(Current) Accept Rate</th>
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<tbody>
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<td>2001</td>
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<tr>
<td>2002</td>
<td>233</td>
<td>24.00%</td>
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<tr>
<td>2003</td>
<td>355</td>
<td>26.40%</td>
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<tr>
<td>2004</td>
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<tr>
<td>2005</td>
<td>480</td>
<td>30.00%</td>
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<tr>
<td>2006</td>
<td>588</td>
<td>23.00%</td>
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<tr>
<td>2007</td>
<td>625</td>
<td>22.00%</td>
</tr>
<tr>
<td>2008</td>
<td>680</td>
<td>being accept'd, 0.06% @ 1/23/09</td>
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</tbody>
</table>

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Why Write a Scientific Paper

- Advance knowledge in your research field with evidence
- Explain your ideas and make them accessible to others
- Two key components in a research paper:
  - An explicit claim on your contribution on a research problem
  - Evidence to support your claim
- Your contribution can possibly be a refutation of a hypothesis on the research problem
- [Take-Home Message #1] It is NOT enough to design yet another technique or system without convincing evaluation.
What to Claim for a Scientific Paper

- Your technique solves a problem for the first time
- Your technique performs better, in one or more of the following dimensions [Alan Bundy, How-To Guides, homepages.inf.ed.ac.uk/bundy/howtos/writingGuide.html], than its rivals:
  - Behaviour: X has a higher success rate than Y or produces better quality outputs, e.g. shorter, easier to understand, more similar to human outputs, etc.
  - Coverage: X is applicable to a wider range of examples than Y
  - Efficiency: X is faster or uses less space than Y
  - Useability: Users find X easier to use than its rivals
- [Take-Home Message #2] You should avoid claiming too many dimensions, but one or two with in-depth evidence.
Typical Structure of a Research Paper (1)

- Title: Catchy and indicative of your research contribution
  - ICDM Data Mining on ICDM Paper Submissions (ICDM Negative Association Rule):
    - The longer a paper title, the lower its acceptance chance
    - (Less possibility for being incremental work)
- Abstract: A summary of the research problem, your claim, and the evidence
- Introduction: Motivation, a re-statement of the abstract information, significance, an outline of the rest of the paper
- Related work:
  a. A critical review on the rival approaches that supports the motivation
  b. How to differentiate existing work with your own creative contributions.
Research Paper Structure (2)

- Problem statement and algorithm design:
  - Explain your ideas in detail, with examples
  - Highlight your contributions
  - Do **NOT** simply put your algorithms in pseudo code!
  - Show your novelty

- Evaluation: Evidence to support the claim of your research contribution
  - Unless you can provide proofs for a theoretical paper on theorems, experimental results are always expected

- Conclusion: A summary of the research contribution, a discussion on its significance, and a mention of future work

- References: List and *cite* related work.
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What to Know Before You Write

- Assess the audience: To whom are you writing? Why will they be reading your writing?
- Assess the purpose: What should the reader take away?
- Read other people’s writing from the forums that you are targeting
  - Language skills and the writing style are always important
  - A paper published in one top journal can easily get rejected by another top journal – community difference or cultural difference
- [Take-Home Message #3] Know your enemy: Check who are on the program committee or editorial board, and cite their relevant work with due credit
- Follow the rules – length limits, formatting standards etc.
How to Write a Top-Quality Paper

- [Take-Home Message #4] **Choose a promising topic**
  - 10 Challenging Problems in Data Mining Research (presented by Qiang Yang & Xindong Wu at ICDM ’05)
    - A topic of your interest
    - Your background for the topic
    - Advice from your advisor and senior researchers

- Present a convincing case
- Provide in-depth analysis of empirical results
- Spend more time on the introduction.
How to Present a Convincing Case

- What exactly is the problem being solved?
- How are your ideas **significant** (to justify a paper)?
  - Some ideas are so simple that have been used many times w/o being published
- Is all related work referenced and reviewed?
- Are the comparative studies with previous work convincing?
- Has your system been implemented and used, and if so what did it demonstrate from the real world (for you and the reader to learn)?
In-Depth Analysis of Empirical Results

- Enough details for (a) your experiment settings (so that other researchers can verify and improve your results), and (b) your experimental objectives
- What were the alternatives considered at various points of your experiments? Why and how have you made the choices for your experiments?
- [Take-Home Message #5] Are the experimental results consistent and conclusive?
- Can you fine-tune some key parameters to get better or worse results? If so, use figures and tables to show their impacts on your system performances
- How do the experimental results correspond to the motivation of the paper?
- What have you found surprising and tried to avoid in these experiments? How generally applicable are these lessons?
The Most Important Part of Your Paper: the Introduction

- The 1/3 – 2/3 Rule from a reviewer’s perspective:
  - 1/3 time to read your introduction and make a decision
  - Remaining 2/3 time to find evidence for the decision

- [Take-Home Message #6] A good introduction with a good motivation is half of your success!

- What to cover in the introduction
  - The research problem
  - The motivation of your research on the research problem
  - The claim of your contribution
  - A summary of your evidence to support your claim
  - The significance of your contribution
  - An outline of the rest of the paper.
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How to Publish at ICDM and TKDE (1)

- ICDM and TKDE both look for significant technological contributions
- ICDM and TKDE are both very tough, expecting best results in their respective research field
- [Take-Home Message #7] Reading and citing relevant papers from the premier forums (incl. ICDM/KDD and TKDE) is a must
- A possible way to publish in both ICDM/KDD and TKDE:
  - Submit to ICDM/KDD to get (quick) feedback
  - Expand & submit to TKDE if positive feedback from ICDM/KDD, with
    a. at least 30% new material, and
    b. a title footnote to state the conference acceptance/publication.
How to Publish at ICDM and TKDE (2)

- How about application papers?
  - Application papers are always invited, but innovations are necessary. A case of an innovative application must be presented, for the ICDM/TKDE audience.

- How about data analysis w/o large volumes of data?
  - Experiments on large databases are not always required, but generally expected
  - Reasons on why not large data sets should be explained.

- Most important of all: the uniqueness of your research in the field!
  - You work has to be (1) technically sound, (2) relevant, (3) original, (4) significant, and (5) well clarified.
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The Review Process

- **TKDE**
  - EiC: Assign papers to AEs, and handle inconsistency between the AE and reviewers
  - AE: Solicit reviewers, and coordinate the review process
  - Reviewers: Read and provide reviews

- **ICDM**
  - PC Chairs: Assign papers to Area Chairs and PC members
  - Area Chairs: Resolve conflicting reviews and make paper acceptance recommendations
  - PC members: Reviewers.
How to Deal with Feedback (1)

- How to deal with Handling Editors
  - Be polite, but to the point
  - Ask for a change, if a clearly biased or unfair case

- How to deal with conflicting review reports
  - For journal submissions
    - Try every effort to address every concern
    - [Take-Home Message #8] **Provide a point-by-point statement of changes**
      - Use other reviewers’ comments to disagree with the negative ones
  - For conference submissions
    - Rebut if you think you have a reasonable chance to win – Nothing to lose
    - Get senior authors involved in the rebuttal.
How to Deal with Feedback (2)

- How to deal with “arrogant” and “ignorant” reviewers
  - If there is no chance to win them over, provide a gentle statement for the “unreasonable” criticisms that you are not addressing
  - You should still try and resolve some of their comments
  - Your attitude towards the reviewers’ comments is important – all reviewers will read your statement of changes, and an accommodating approach is useful.

- Critical reviews are always expected from first-rate journals and conferences – Don’t get emotional with negative comments

- [Take-Home Message #9] **Be accommodating and persistent in journal submissions** & good luck!!
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5. Are the experimental results consistent and conclusive?
6. A good introduction with a good motivation is half of your success!
7. Reading and citing relevant papers from the premier forums is a must
8. Provide a point-by-point statement of changes (when dealing with journal feedback)