How to write reports, scientific papers, thesis?

Mobile and Cloud Computing Seminar (MTAT.03.280)
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Outline

• Elements of an academic paper
• Checklist
• Ph.D.
• PostDoc

How to write reports, scientific papers, thesis?
Main focus in this session

Academic writing
- written by professionals
- Specific to a field
- edited/reviewed by the authors' peers
- often take years to publish.
- language is formal
- list of references

Publication types:
- Articles in Journals
- A book/monograph
- Book chapter
- Proceedings
- Editing scientific publications
- Review articles
- Short notes

How to write reports, scientific papers, thesis?
Know your topic first
Elements of an Academic Article

- Title Page
- Abstract
- Introduction
- Literature survey
- Problem statement
- Proposed solution
- Performance Evaluation
- Conclusion and future works
- References

How to write reports, scientific papers, thesis?
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This may be different:
• Survey paper
• Magazines
• Short paper

How to write reports, scientific papers, thesis?
Elements of an Academic Article

• Title Page
• Title:
  • Usually 4-12 words in length.
  • Should be short, specific and descriptive, containing the keywords of the report.
• Authorship
  • Sometime very confusing when author name has more than two words. Sometime I use Chinmaya Kumar Dehury, sometime Chinmaya Dehury (mostly)
  • Email-ID
  • Affiliation
  • May also contain Membership (IEEE member, IEEE Senior member, etc)
  • Some academic research profile ID (e.g. ORCID ID)
• Article History
• DOI
• Imp:
  • usually you will not find separate title page in most of the computer science related research articles
  • This may require while submitting a paper for publication

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Example

MUVINE: Multi-Stage Virtual Network Embedding in Cloud Data Centers Using Reinforcement Learning-Based Predictions

Hiren Kumar Thakkar, Member, IEEE, Chinmaya Kumar Dehury, and Prasan Kumar Sahoo, Senior Member, IEEE

Abstract—The recent advances in virtualization technology have enabled the sharing of computing and networking resources of cloud data centers among multiple users. Virtual Network Embedding (VNE) is highly important and is an integral part of the cloud resource management. The lack of historical knowledge on cloud functioning and inability to foresee the future resource requirements for virtual networks pose significant challenges in VNE. This work proposes a novel approach to address these issues by utilizing reinforcement learning (RL) techniques. The proposed solution, MUVINE, employs a state-of-the-art RL framework to dynamically allocate virtual networks in a cloud environment. By adapting to the changing conditions, MUVINE optimizes the resource allocation, ensuring efficient and effective use of cloud resources.

The primary concern of any Cloud Service Provider (CSP) is to ensure the quality of cloud services to the end users with optimum computing resources that translate into the maximum profit. Accordingly, various heuristics-based, nature-inspired learning-based, and Artificial Intelligence (AI)-based
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Example

MUVINE: Multi-Stage Virtual Network Embedding in Cloud Data Centers Using Reinforcement Learning

The cloud computing is a recent advancement in virtualization technology that can dynamically provision infinite computing resources to the end users on pay as you use basis.

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Color versions of one or more of the figures in this article are available online at: http://ieeexplore.ieee.org.

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Example

CCoDaMiC: A framework for Coherent Coordination of Data Migration and Computation platforms

Chinmaya Kumar Dehury, Satish Narayana Srirama*, Tek Raj Chhetri
Mobile & Cloud Lab, Institute of Computer Science, University of Tartu, Tartu 50090, Estonia

Article Info
- Article history:
  - Received 20 November 2019
  - Accepted 10 March 2020
  - Available online 18 March 2020
- Keywords: Data pipeline, Data flow management, Serverless computing, Data migration, TOSCA

Abstract
The amount of data generated by millions of connected IoT sensors and devices is growing exponentially. The need to extract relevant information from this data in modern and future generation computing system, necessitates efficient data handling and processing platforms that can migrate such big data from one location to other locations seamlessly and securely, and can provide a way to preprocess and analyze that data before migrating to the final destination. Various data pipeline architectures have been proposed allowing the data administrator/user to handle the data migration operation efficiently. However, the modern data pipeline architectures do not offer built-in functionalities for ensuring data veracity, which includes data accuracy, trustworthiness and security. Furthermore, allowing the intermediate data to be processed, especially in the serverless computing environment, is becoming a cumbersome task. In order to fill this research gap, this paper introduces an efficient and novel data pipeline architecture, named as CCoDaMiC (Coherent Coordination of Data Migration and Computation), which brings both the data migration operation and its computation together into one place. This also ensures that the data delivered to the next destination/pipeline block is accurate and secure. The proposed framework is implemented in private OpenStack environment and Apache NiFi.

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Elements of an Academic Article

Example

Future Generation Computer Systems

Handling the data refers to transforming the data from one structure to another, processing the data to retrieve the useful information, and eventually loading the processed or the raw data to the desired location. Based on the situation, these operations to fog/edge computing for pre-processing the data followed by moving the data for final processing in cloud computing [9].

The current Data Pipeline (DP) architectures are providing a way to handle the flow of the data from one provider to another provider, e.g., from fog to cloud or from edge devices to nearby fog environments. The DP architectures also provide functionalities to carry out the fundamental pre-processing operations. The fundamental pre-processing operations could be replacing computing system, necessitates efficient data handling and processing platforms that can migrate such big data from one location to other locations seamlessly and securely, and can provide a way to preprocess and analyze that data before migrating to the final destination. Various data pipeline architectures have been proposed allowing the data administrator/user to handle the data migration operation efficiently. However, the modern data pipeline architectures do not offer built-in functionalities for ensuring data veracity, which includes data accuracy, trustworthiness and security. Furthermore, allowing the intermediate data to be processed, especially in the serverless computing environment, is becoming a cumbersome task. In order to fill this research gap, this paper introduces an efficient and novel data pipeline architecture, named as CoDaMIC (Coherent Coordination of Data Migration and Computation), which brings both the data migration operation and its computation together into one place. This also ensures that the data delivered to the next destination/pipeline block is accurate and secure. The proposed framework is implemented in private OpenStack environment and Apache Nifi.

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How to write reports, scientific papers, thesis?
Elements of an Academic Article

Abstract

• Summary of the whole paper/article
  • 1-2 sentences on background
  • 1-2 sentences on problem/motivation
  • What this paper is proposing?
    • Introduce the name of your solution

• Goal
• Using what tool?
• How the proposed system works
• Simulation/experiment performance
• Conclusion/implications
Elements of an Academic Article

Abstract

- **Around ~ 200 words**
  - sometimes 100-120 word, or < 150 words
- Depends on the page limit and the publisher
- Conferences usually have less word limit
- Publishing houses use Abstract to recommend journals for the publication
- This is open/public all the time
- The following should not be included in the Abstract:
  - Literature citations.
  - Formulae and abbreviations, references to tables.
  - Never refer to figures or tables in your abstract.
- Although the Abstract comes first in a report, it is sometime suggested to write it last, after you have the results and conclusions. (It varies person to person)
Elements of an Academic Article

Introduction

• Introduction of a research paper
• Lets say the topic is
  • “DYVINE: Fitness-Based Dynamic Virtual Network Embedding in Cloud Computing”
• Understand the keywords
• Start from a broad term
• Introduce the keywords
  • E.g. cloud computing --> VNE--> embedding method.....
• towards end of the introduction:
  • Give a hint to the concerned problem
• Avoid unnecessarily long paragraphs.
Elements of an Academic Article

Introduction

• Motivation
  • Best to give an motivational example
  • If possible give in pictorial form
  • Link with real world application
  • ---- example demo ---:

• Contributions and goals
  • Contribution should be in bullet points
  • Should not have multiple goals
  • ---- example demo ---:

• Last paragraph: Organization of the paper
Elements of an Academic Article

Background

- Sometime different from Introduction
- Your paper may not have a background section
  - So combine with the introduction section
- This mostly focused on the background of the specific technology or concept
  - E.g. for previous title, background should focus around the fault tolerant strategies
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Literature Survey

• aka Related works

• to get related papers:
  • Find the keywords
  • Search with keywords in IEEE Explorer, Google scholar, Sciencedirect and other search engines
  • Go through the papers and see if you got any new close keywords

• For each paper
  • Get the summary
  • Find the limitations

• Categories the papers (Example)

• Give a comparison table

How to write reports, scientific papers, thesis?
Elements of an Academic Article

Problem Formulation/Statement

- Explain the problem on the basis of your goal, literature survey
- Model the whole environment
  - Don’t forget to give the list of notations
  - Don’t forget to give the equation numbers
  - Make sure notations are defined, used and are unique
  - Make sure all acronyms are defined
Elements of an Academic Article

Problem Formulation/Statement

- Specify your objective
- Demonstrate your proposed system with and an example
Elements of an Academic Article

Proposed

• Algorithm/Architecture/Framework/Strategy

• Introduce the name of the proposed solution (this can be in heading)

• Detailed explanation of your paper
  • Algorithms
  • Mathematical proof with theorems, lemmas etc.
  • Don’t forget to justify if you are saying “optimal” or “novel”

• Demonstrate your proposed system with and an example
  • ---- example demo ---:
Elements of an Academic Article

Performance evaluation

• Simulation or experiment
• Implementation setup
• Which simulator
• Simulation configuration
• Short description on the related algorithm with which you are comparing your framework/algorithm
• Performance metrics for comparison
  • Definitions
  • How to calculate?
Elements of an Academic Article

Performance evaluation

• Simulation or experiment

• Results
  • Graphs/figures/data
  • Graphs should be very clear
  • You may use Excel or built-in tools or latex tools to draw the graph
  • Should be in eps or in pdf format

• Result discussion
  • Why this behavior ?
  • Quantify the improvement
Elements of an Academic Article

Conclusions and Future works

• Conclude the paper
• Give a paragraph on the future work
  • No paper is COMPLETE
Elements of an Academic Article

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• Proposed solution
• Performance Evaluation
• Conclusion and future works
• References

• References
  • Make sure all are cited
  • No missing references
  • Search for ‘?’ in the final pdf
  • Make sure all references are consistent format
    • Recommended to use latex bibliography
  • Number of references
    • Check with the journal requirement, if any.
Checklist
Checklist before submission

- Spelling and grammar
- Vocabulary
  - Avoid: very weak vocabulary choices
  - Avoid REPETITION
- Avoid self-reference such as “… as I explained in the previous Chapter, …”
- No very long sentences
- Usually I don’t use any plagiarism finder
  - Why?
- List of acronyms
- List of mathematical notations
- Equation numbers
Checklist before submission

- Table captions, including their position
- Figure captions, including their position
- All tables and figures are referred
- Keywords
- Page limit of journal/conf.

Please go through UT’s recommendation to write your thesis [src](pdf: Jump to “Sec 3. The structure and format of theses”)
Please go through

PhD Introduction Evening 2021 - UT

https://www.youtube.com/watch?v=DkpRvDcZsgc
PostDoc

How to write reports, scientific papers, thesis?
PostDoc

- A temporary working position
- Responsibilities: Not different from a professor
- 1 yr – 3 yrs
  - May go more or less
- How to get?
  - From the paper in your domain
    - Compile a list of professors, research groups
  - Email them
  - Follow them
    - Youtube, Linkedin, Twitter, Facebook, Their official websites etc…
- Work more independently
- Need a supervisor
References

• https://cra.org/resources/best-practice-memos/computer-science-postdocs-best-practices/
• https://www.youtube.com/channel/UCU1dUq5AqqdyTPj6UZjGHLQ/videos
• https://slc.berkeley.edu/writing-worksheets-and-other-writing-resources/nine-basic-ways-improve-your-style-academic-writing
• https://en.wikipedia.org/wiki/Academic_writing
• https://www.wlc.edu/uploadedFiles/Content/Academics/Student_Success_Center/ResearchPaper.pdf

How to write reports, scientific papers, thesis?
Q&A

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