

WU Duo

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EDUCATION

Jinan University | China

09/2018 - 07/2022

- Major: Computer Science & Technology
- Division: Department of Computer Science
- School: College of Information Science & Technology
- GPA: 3.89/5.00 (88.9/100), TOP 10%
- Honors & Scholarships:
 - ✧ Jinan University '5A' Excellence Leadership Program – 'Academic Star' (Nominated) 12/2021
 - ✧ Jinan University Jinlongyu Scholarship of 2021-2022 Academic Year - Undergraduate Innovation Talent Special (10000 RMB, Only 30 Awardee) 11/2021
 - ✧ 2nd Prize of Outstanding Student Scholarship of 2020-2021 Academic Year 11/2021
 - ✧ 2nd Prize of Outstanding Student Scholarship of 2018-2019 Academic Year 05/2020

PUBLICATIONS

- ❖ **Duo Wu, Lin Cui.** *A Comprehensive Survey on Segment Routing Traffic Engineering*. Accepted in Digital Communications and Networks, 2022. (JCR-Q1, IF: 6.797)

RESEARCH INTERESTS

- ❖ Cloud and Edge Computing; Parallel and Distributed Systems; Deep Learning and Reinforcement Learning; Multimedia Systems and Applications.

ACADEMIC EXPERIENCE

A Comprehensive Survey on Segment Routing Traffic Engineering

11/2019 - 11/2020

First Author

- **Topic:**
This survey paper comprehensively reviews the innovative SR-TE architecture for network performance optimization, including SR Policy, Flexible Algorithm and SR-native algorithm. Strengths of SR-TE are also discussed, as well as its major challenges. Besides, this paper provides extensive summaries and analysis of the state-of-the-art SR-TE research works. Finally, it ends with several research directions worth future exploration to facilitate the development of SR-TE research.
- **Step One: Extensive Collecting and Reading Literature**
Collected relevant materials, extensively scrutinized related literature and wrote reports for research papers covering their research backgrounds, objectives, solutions, advantages and disadvantages, etc.
- **Step Two: Writing Paper**
Investigated the links, differences, highlights and challenges of SR-TE techniques and solutions on basis of the collected materials and literature, well organized the writing structure with the bottom-up logic, and finished the paper with the supplement of many figures and tables.
- **Step Three: Proposing Future Research Directions**
Proposed several worthy and in-depth future research directions on basis of our survey work and personal insights. For instance, implement machine learning algorithms in SR-TE to address some open issues such as segment list computation and traffic matrix prediction.

Research on Micro-Loop in Heterogeneous Segment Routing Networks

12/2020-05/2021

Person in Charge

- **Topic:**
This research proposes a distributed solution which efficiently avoids micro-loop in heterogeneous SR networks by carefully crafting 'lies' to deceive routers to change their routing tables. Performance evaluation results show that the proposal can reduce at most ~60% of the average duration of micro-loops without causing too much networking overhead. This project was granted by the Innovation and Entrepreneurship Training Program for College Students, Jinan University, No. CX20005.
- **Step One: Literature Reading and Idea Forming**
Delved into the collected literature and formed the main idea of the proposed solution: injecting 'lies' (i.e. OSPF type 5 LSAs of specific forwarding information) into networks to enable non-SR routers to steer traffic along the loop-free post-convergence paths.
- **Step Two: Solution Design**
Developed the core algorithm for crafting LSAs based on Dijkstra shortest-path; designed the workflow of the proposed solution and completed its details (e.g. fixed the 'Age' field of each LSA to a large and

appropriate value to prevent them from functioning too long and causing unpredictable negative effects).

■ **Step Three: Experiment Design and Implementation**

Completed the experimental design including network topology selection, link parameter setting, comparative experiment design, etc. under the supervision of my supervisor; learned the Python language and other experimental tools (such as Mininet, SRv6, Quagga) independently; and finally implemented all the experiments independently.

The 2nd China Collegiate Algorithm Design & Programming Challenge Contest (Spring) 06/2021 **Team Leader**

■ **Outline:**

Worked with other two students to solve 11 programming problems within 5 hours in the Contest. Successfully solved 8 problems when the Contest ended, ranked **TOP 5%** among **1300+** teams, and won the **Gold Award**.

■ **Contribution One: Strategy Making**

Decided problem reading strategies to quickly find and solve the simple problems for a higher ranking, and managed to solve **three** simple ones within the **first 20 minutes**.

■ **Contribution Two: Algorithm Design**

Developed the algorithms of **two** problems - solved Problem A with Floyd algorithm and designed the DP state and transition equation of the algorithm; designed a solution based on MO's algorithm for Problem B.

■ **Contribution Three: Coordination and Cooperation**

Organized teammates to identify the problems that were most likely resolvable, and cooperated with them to solve the problems identified. Finally, solved **another three** problems and thereby successfully achieved a high ranking.

Research on Accelerating DNN Training on End Device Based on Cloud and Edge Computing **Thesis**

12/2021-04/2022

■ **Topic:**

This thesis focuses on the cloud-edge-end based DNN training acceleration. The distributed training scheme based on model parallelism is used to speedup training on end device and reduce device power consumption, which partitions DNN into several successive sub-models and deploys them on the end, edge and cloud for collaborative training. This thesis first proposes the system model to evaluate the relevant metrics in DNN parallel training. Afterwards, based on dynamic programming, an algorithm called Energy-constrained Partitioning Algorithm (EPA) is designed. Experimental results show that compared to local training, EPA can speedup DNN training by 2.51× and reduce power consumption by 57.7%.

■ **Step One: System Model and Problem Formulation**

Proposed the system model to evaluate the training time and energy consumption in DNN parallel training, formulated the model partitioning problem with ϵ -constraint method.

■ **Step Two: Algorithm Design**

Designed the model partitioning algorithm EPA based on dynamic programming, which will provide the partitioning solutions that minimize training time under the energy constraint in polynomial time.

■ **Step Three: Experiment Implementation**

Completed experiment design, used *torch.distributed.rpc* package in PyTorch to implement DNN model parallel training across multiple machines, and used Mininet to instantiate network topology and light-weight virtual machines.

INTERNSHIP EXPERIENCE

HUAWEI TECHNOLOGIES CO., LTD.

07/2021-09/2021

Software Engineer (Intern), ICT Products & Solutions – BMC Software Development

■ **Duties:**

Engaged in the development of Java Web backend server based on Spring Boot framework; responsible for the design and development of FRUD Kit in Heavenly Pond Architecture.

■ **Task One: Implementing FRUD Temporary File Services**

Used frameworks such as Spring Data JPA and Servlet to implement the functions of page query, edit, downloading and deleting of FRUD temporary files; leveraged JUnit framework to complete unit testing.

■ **Task Two: Generating FRUD File**

Decomposed the module of FRUD file generation from top to bottom with the help of HIPO and Class Diagram; finally designed 7 classes and 16 sub-modules, and wrote codes (about 1000 lines) to implement the core function.

■ **Task Three: Generating CDR Topology Information**

Modeled the CDR topology graphical raw data received from frontend into Directed Acyclic Graph based on the Graph Theory; used topological-sort and recursive algorithms to convert the raw data into CDR

topology data in specific format (employed data structures such as Array, Queue, Hash Set/Map to improve efficiency).

COMPETITION AWARDS

National-level:

- ✧ *Gold Award* | The 2nd China Collegiate Algorithm Design & Programming Challenge Contest (Spring Competition) 06/2021
- ✧ *1st Prize* | The 12th Lanqiao Cup National Software and Information Technology Professional Talent Competition (National Final), Python Programming University Group 06/2021
- ✧ *Bronze Award* | The 2nd China Collegiate Algorithm Design & Programming Challenge Contest (Winter Competition) 03/2021
- ✧ *Individual 3rd Prize* | 'China University Computer Competition – Group Programming Ladder Tournament' National Final 12/2020
- ✧ *3rd Prize* | The 11th Lanqiao Cup National Software and Information Technology Professional Talent Competition (National Final), C/C++ Programming University Group A 11/2020
- ✧ *3rd Prize* | The 2020 National College Students Software Testing Contest Final 11/2020

Provincial-level:

- ✧ *1st Prize* | The 12th Lanqiao Cup National Software and Information Technology Professional Talent Competition (Guangdong Division), Python Programming University Group 05/2021
- ✧ *Group 1st Prize* | 'China University Computer Competition – Group Programming Ladder Tournament' TOP-competing Group of Guangdong Province 12/2020
- ✧ *2nd Prize* | The 2020 National College Students Software Testing Contest Semifinal (Guangdong Division) 11/2020
- ✧ *1st Prize* | Lanqiao Cup National Software and Information Technology Professional Talent Competition (Guangdong Division), C/C++ Programming University Group A 10/2020
- ✧ *3rd Prize* | The 2019 China University Student Programming Competition - Guangdong Provincial Collegiate Programming Competition 05/2019

University-level:

- ✧ *2nd Prize* | The 2019 'Huawei Cup' ACM Program Design Point Competition of Jinan University 06/2019
- ✧ *1st Prize* | The 7th 'Huawei Cup' ACM Programming Competition of Jinan University 04/2019
- ✧ *3rd Prize* | The ACM Programming Competition for Training Camp Selection of Jinan University 12/2018

STANDARD TEST

- ❖ **IELTS:** Overall 7.0 (L:7.5 /R:8.5 /W:6.5 /S: 5.5) 05/2021

INTERESTS AND OTHERS

- ❖ Strong in Python, C/C++ programming, master Java programming.
- ❖ Wrote blogs on CSDN to record personal learning and growth process. By Feb. 2022, published **333** original blogs covering data structures, algorithms and computer networks etc. with a total of more than **80,000** page views. (Website: <https://blog.csdn.net/shamansi99?spm=1000.2115.3001.5343>)
- ❖ Homepage: <https://duowuyms.github.io/>