# Hao Xu

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## Education

**Fudan University, School of Computer Science and Technology** — *Shanghai, China*
M.Eng. in Electronic Information — *Sept 2021 - Current*

- GPA: 3.46/4
- Supervised by Jin Zhao in Shanghai Key Laboratory of Intelligent Information Processing

**Northeastern University, School of Computer Science and Technology** — *Shenyang, China*
B.Eng. in Computer Science and Technology — *Sept 2015 - June 2019*

- GPA: 84/100

## Industrial Experience

**Intel** — *Shanghai, China*
Algorithm Engineer — *Feb 2022 - Current*

- Collaborate with a six-person team to develop Hyperscan, a SOTA regular expression matching engine which has been deployed in network security solutions worldwide. It has been integrated into widely used open-source IDS and IPS products like Snort and Suricata.
- Design, develop and benchmark Teddy and Harry, two pattern matching algorithms for small-scale and large-scale pattern sets respectively. Utilize SIMD to accelerate the matching process.
- Teddy can match dozens to hundreds of patterns simultaneously, boosting the matching speed by 200% on a single commodity server. Harry can match hundreds to thousands of patterns, boosting the speed by 40%.
- **Technical Skills:** SIMD, C, C++, Linux, Git

**Bytedance** — *Shanghai, China*
Network Engineer — *May 2021 - Sept 2021*

- Build a testbed to test the functionality and performance of P4 gateway. The testbed utilizes a single server to simulate multiple network topologies(e.g. gateway connecting with switches, gateway connecting with servers, gateway connecting with both switches and servers).
- **Technical Skills:** Docker, Python, Pytest, Ansible, Linux, Git

**Sangfor** — *Beijing, China*
Software Engineer — *July 2019 - Aug 2020*

- Develop the control plane of an SDN system.
- **Technical Skills:** Redis, Kafka, Python, Java, Linux, Git

## Publications

### Conference Proceedings

- **Hao Xu**, Harry Chang, Wenjun Zhu, Yang Hong, Geoff Langdale, Kun Qiu, Jin Zhao, "Harry: A Scalable SIMD-based Multi-literal Pattern Matching Engine for Deep Packet Inspection". In *IEEE International Conference on Computer Communications* **(INFOCOM'23)**. *Acceptance Rate: 252/1312=19%.* [Deployed in Hyperscan]

### Journal Articles

- **Hao Xu**, Harry Chang, Kun Qiu, Yang Hong, Wenjun Zhu, Xiang Wang, Baoqian Li, Jin Zhao, "Teddy+: An Enhanced SIMD-based Literal Matching Engine for Deep Packet Inspection". In *IEEE Transactions on Parallel and Distributed Systems* **(TPDS)**. [Deployed in Hyperscan] [In Review]

## Achievements

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| 2022 | **Winner**, Intel Fellowship | *Shanghai, China* |
| 2022 | **Winner**, Intel Excellent Intern | *Shanghai, China* |
| 2021 | **423/500 Top 1%**, Unified National Graduate Entrance Examination | *Shanghai, China* |
| 2016 | **Winner**, National Encouragement Scholarship | *Shenyang, China* |
| 2016 | **Level 1**, Northeastern University Scholarship | *Shenyang, China* |