

AKSHAY JOSHI

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EDUCATION

ETH Zurich, Zurich, Switzerland Feb 2022 - Present
Master of Science Research Thesis GPA: In Progress
Research Area: Vision & Language, Visual Reasoning *Advisor: Prof. Dr. Mrinmaya Sachan*

University of Saarland, Saarbruecken, Germany Oct 2019 - Present
Master of Science in Data Science & Artificial Intelligence GPA: 1.9/5.0
Research Area: Natural Language Understanding *Advisor: Prof. Dr. Josef van Genabith*

Visvesvaraya Technological University, Karnataka, India Aug 2013 - Jun 2017
Bachelor of Engineering in Computer Science & Engineering GPA: 8.03/10
Research Area: Distributed Computing, Security *Advisor: Prof. Dr. Shashikumar D R*

PUBLICATIONS

- **Akshay Joshi**, Ankit Agrawal, Sushmita Nair, “Art Style Classification with Self-Trained Ensemble of AutoEncoding Transformations”, arXiv:2012.03377, 2020.
- **Akshay Joshi**, Peter Pfeiffer, Annalena Kohnert, Philip Hake, Peter Fettke, Peter Loos, “PubMedSMBERT: A Pretrained Biomedical Language Model for Medical Smart Vigilance”, Under Internal Review, 2022.

EXPERIENCE

Google Research Feb 2022 - Present
Joint Research Thesis, Zurich, CH *Advisors: Dr. Alessio Tonioni, Dr. Henry Rebecq*

- Working with the Machine Perception (AR/VR) team to develop novel self-supervised Multimodal Transformer architectures, and large-scale vision-language pretraining objectives for representation learning of densely structured scientific diagrams.
- Investigating structural parsing, semantic interpretation & multi-hop reasoning in the context of Diagram Question Answering & Cross-Modal Retrieval.
- Setup a Mechanical Turk task to congregate a 1,000,000 large open-source diagram dataset which would be released to the research community for large-scale self-supervised Vision-Language model pretraining.

German Research Center for Artificial Intelligence Feb 2022 - Present
Joint Research Thesis, Saarbruecken, DE *Advisors: Dr. Cristina E. Bonet, Yasser Hamidullah*

- Research on large-scale Language Modeling & Hybrid Multimodal Fusion in the ‘Machine Translation’ group at the ‘Multilinguality and Language Technology’ research department.
- Devising novel methods to efficiently encode extremely long diagram descriptions/captions & multimodal fusion strategies to mitigate strong priors imposed by language/text modality.

German Research Center for Artificial Intelligence Nov 2020 - Present
Deep Learning Student Researcher, Saarbruecken, DE *Advisors: Prof. Dr. Peter Loos, Peter Pfeiffer*

- Developing novel & explainable Self-supervised Transformer-based Language Model architectures for Biomedical Natural Language Understanding. The models are pre-trained on ~40 million clinical research reports.
- Achieved ~2% relative improvement over the current state-of-the-art methods in PubMedQA, EBM PICO, BC5-disease & BIOSSES downstream tasks in the Microsoft BLURB Biomedical NLP benchmark.
- Built highly parallel & computationally efficient Semantic Search (retrieves & ranks ~2 million documents in <3 sec) & Recommendation System for Smart Vigilance in Medical Product Research & Development.

Artificial Intelligence Group - Saarland University Oct 2020 - Mar 2021
Graduate Teaching Assistant, Saarbruecken, DE *Advisor: Prof. Dr. Jana Koehler*

- Tutored & graded the ‘Architectures for Intelligent Systems’ course, which had a cohort of ~45 M. Sc. students from Computer/Data Science, Embedded Systems, Visual Computing, and Bioinformatics majors.
- Performed 2 iterations of development of a reference architecture & corresponding architectural design documents for a cloud-powered Conversational Question Answering Smart Digital Assistant in ~4 months.

AMD Research & Development

Aug 2018 - Sep 2019

Software Engineer, Bangalore, IN

- Implemented platform initialization routines of the off-chip phase of Platform Security Processor (PSP) firmware for Ryzen 3000 (Matisse & Castle Peak architecture) processors in ~5 months.
- Extended & validated the support for Microsoft PlayReady DRM protection technology in PSP firmware for Ryzen Pinnacle & Raven Ridge family of desktop & mobile x86 processors in 3 months.
- Developed python scripts to automate the building & validation of BIOS patches for RyzenFall, MasterKey, Fallout, Chimera, and other vulnerabilities affecting the secure chip-on-chip processor in <6 months.

AMD Research & Development

Feb 2018 - Aug 2018

Software Engineering Intern, Bangalore, IN

- Developed & validated the AMD Ryzen Master Software Development Kit for CPU/Memory Overclocking (Frequency, Voltage, Timing), Core Parking, and Simultaneous Multithreading utilities.
- In a span of 6 months, delivered ~70 multi-platform Windows SDK APIs. Further, established & documented >100 unit test cases & a detailed test plan for Ryzen Master CLI tool validation.

Alstom

Jan 2017 - Mar 2017

Engineering Intern, Bangalore, IN

- Developed an end-to-end PySpark data preprocessing pipeline which comprises of Data Cleansing, Transformation, Statistical Analysis & Feature Selection. Reduced the computation time of older pipeline by 12%.
- Built & evaluated Multivariate Regression & ARIMA Forecast Models for Predictive Analytics on Alstom EMEA employee compensation data using A/B Tests. Mean Average % Error of the best model: ~17%.

SKILLS

- **Languages:** Python, C/C++, Rust, SQL
- **Libraries:** PyTorch, NumPy, Scikit-learn, Numba, Scipy, OpenCV, Pandas, Flask, Spark, Kafka, MLflow
- **Tools:** Git, Docker, Kubernetes, Jira, WandB, Postman, Nginx, CMake, LaTeX, AWS, CI/CD, IBM LSF

PROJECTS

- Exploiting Point-level Correspondences for Unsupervised 3D Point Cloud Understanding.
- 3D Pose and Shape Estimation with Stitched Puppet Model & Max Product Belief Propagation.
- Open-domain Question Answering over Knowledge Graphs & Text Passages with Memory Networks.
- Real-time Event-driven Multi-lane Vehicle Detection & Counting for Adversarial Situation Tracking.
- Highly Scalable, Resilient, and Secure Distributed Microservices Mesh to deploy the Multimodal Diagram Understanding model & 1 million sample Pretraining Dataset on AWS EC2, S3, Lambda, Aurora & Redshift.

SEMINARS

- Hybrid Machine Learning Seminar on ‘Learning like Humans with Deep Symbolic Networks’, University of Saarland, Germany. Nov 2020 - Feb 2021.
- Research Poster on ‘Advanced Cryptographic Standards & Security’, Computer Society of India. April 2017.
- Seminar on ‘High Performance Quantum Computing’ at Cambridge Inst. of Tech., India. Mar 17 - May 2017.

ACHIEVEMENTS

- Merit certificate for *top 5%* of the graduating class of Bachelors in Computer Science & Engineering. Total number of graduating students: *106*.
- Recommended by Mr. Satishkumar Narayanaswamy - Director of Technology & Software Engineering at AMD Research & Development for my technical expertise and agile adaptability skills.