Kirtan Padh

Masters Graduate, Computer Science, EPFL

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Education

Swiss Federal Institute of Technology Lausanne (EPFL) 2020
M.Sc. in Computer Science, *Specialisation in* Data Analytics, **Grade: 5.4/6**
Thesis: *A multi-objective approach to fairness in classification* (5.75/6)

Indian Institute of Technology Kanpur (IIT Kanpur), India 2016
B.S. in Mathematics and Scientific Computing, *Minor in* Theory of Computing, **Grade: 8.1/10**

Swiss Federal Institute of Technology Lausanne (EPFL) 2015
Semester exchange, Department of Mathematics, **Grade: 5.9/6**

Publications

Kirtan Padh, Diego Antognini, Emma Lejal Glaude, Boi Faltings, and Claudiu Musat. "Addressing Fairness in Classification with a Model-Agnostic Multi-Objective Algorithm." https://arxiv.org/pdf/2009.04441.pdf (2020) *Under review for publication in AAAI 2021.*

Eva Thelisson, **Kirtan Padh**, and L. Elisa Celis. "Regulatory mechanisms and algorithms towards trust in AI/ML." *In Proceedings of the IJCAI 2017 workshop on explainable artificial intelligence* (XAI), Melbourne, Australia. (2017).

Research Projects

A multi-objective algorithm for fairness in classification Feb '20 - Sep '20
Master's thesis. Supervisors : Prof. Boi Faltings, EPFL and Dr. Claudiu Musat, Swisscom

- Defined a *novel relaxation of statistical-parity based fairness measures* for classification that approximates fairness notions provably better than existing relaxations.
- Defined and implemented a *counterfactual loss* based on the notion of counterfactual fairness, also to be used as an objective in the framework.
- Implemented and *open-sourced a framework* for gradient-based multi-objective optimization.
- Used the relaxations as objectives in the multi-objective framework to optimize for fairness. Submitted for publication in AAAI 2021.

Research Assistant, Combinatorial Optimization 2016 - 2018
Supervisor : Prof. Ola Svensson, EPFL

- Worked on various *combinatorial optimization problems* over graphs including local max-cut, exact matching and the weighted tree augmentation problem.
- Independently rediscovered an additive approximation of the exact matching problem, giving a solution with $n-1$ edges for a graph with $2n$ vertices.

A new algorithm for the uniform capacity k-center problem Feb '15 - Jul '15
Supervisors : Prof. Ola Svensson and Dr. Ashkan Norouzi-Fard, EPFL

- Devised an algorithm based on rounding a *linear programming* solution that uses the spanning tree of a pre-processed graph to give an L-approximation when the capacity of each vertex is L.
- Improves upon the then best approximation ratio when the capacities are small.

Awards & Achievements

| Selected as part of the **Research Scholars MSc Program** for computer science, EPFL. 2016

| Awarded the **KVPY fellowship** in 2013 after securing **All India rank 7** in the fellowship award application among 2000 candidates. 2013–2016

| 3^{rd} prize in a semester long **Combinatorial Problem Solving Contest** organized by Prof. Janos Pach at EPFL as part of the *Geometric graph theory* course. 2015

| Among 25 students selected nationwide to represent India in the **Asian Science Camp** in Japan. Led a multi-national team to win the **best poster award** at the camp. 2013

| Awarded the **INSPIRE fellowship** by the Department of Science and Technology, India. 2012

Teaching Experience

Course Instructor TechSpark Academy, *Switzerland* Aug '19 - present
Teaching programming classes to kids of varying age groups in International schools across Lausanne and Geneva. Taught around 10 virtual and classroom camps until now.

Teaching assistant AICC 2, *EPFL* Feb '19 - Mar '19
Teaching assistant for the Advanced information, computation, communication II course, helping students during the exercise hours.

Open-source Contributions

MAMO-framework swisscom/ai-research-mamo-framework 2020
Collaborated with a group of students to implement a PyTorch framework for model-agnostic multi-objective optimization. Part of the Master's thesis.

iCrawler hellock/icrawler 2018
Added functionalities to crawl Bing to the iCrawler library.

Professional Experience

Swisscom Digital lab, *Machine learning intern*, Lausanne, Switzerland Feb '20 - Sep '20
• Ensured **fairness** in a customer-oriented decision making system without losing out on utility.
• Closely involved in the formulation and implementation of the *Ethics in AI principles* of Swisscom, involving discussion with business stakeholders and members of technical teams across the company.

Phillip Morris International, *Data science intern*, Lausanne, Switzerland Feb '18 - Aug '18
• Responsible for extending existing **image captioning** models to support a product of the company.
• Involved scraping Bing, Google search, Instagram and Flickr and labelling the images semi-automatically through classical and deep learning image segmentation techniques and crowd-sourced labelling.
• Augmented the COCO dataset with the labelled images and re-trained an existing captioning model.

Goldman Sachs, *Summer Strats Analyst*, Bengaluru, India May '16 - Jul '16
• Designed a model for attributing profit and loss from the stock loan business to client hedge funds.
• Collaborated successfully with team members from London and New York to finalize the model.
• Implemented the model independently and pushed it to production.

Academic Projects

Visualising Cancer Data Sep '17 - Jan '18
Supervisor: Dr. Kirell Benzi, EPFL. sharbat.ch/cancer$_d$ataviz/
Represented cancer genomic data on an interactive graph using the information from The Cancer Genomic Atlas. Selected for presentation at Google Research Day 2018 at EPFL.

Disjointness and intersection graphs of convex sets Feb '17 - May '17
Supervisor: Prof. Janos Pach, EPFL.
Surveyed Ramsey-type results for the intersection graphs of convex sets in the plane, and colouring properties of disjointness graphs, and the application of these results to geometric graphs.

Road segmentation from satellite images Sep '16 - Jan '17
Supervisor: Prof. Martin Jaggi, EPFL. kirtanp/Road-Segmentation
Worked on the **computer vision** problem of locating roads from satellite images. Implemented a Convolutional Neural Network (CNN) in TensorFlow and an integer programming post-processing approach to achieve the 5^{th} best F1 score among over 40 groups.

Happiness map of Switzerland Sep '16 - Jan '17
Supervisor: Dr. Michele Catasta, EPFL tbfang/swiss-happy-maps
Performed a **Sentiment analysis** of 6 million geotagged Instagram posts from Switzerland using **FastText** and made an interactive visualization of the happiness of Swiss cantons using R.

Technical Skills

Languages: Python, C, C++, Java, HTML, Javascript, CSS, LaTeX, SQL
ML frameworks: PyTorch, TensorFlow, Keras, scikit-learn
Visualization libraries: Matplotlib, seaborn, D3.js
Others: requests, BeautifulSoup, Selenium, pandas, FastText, NLTK, NumPy, SciPy, Gurobi, Gensim,

Extra Curricular Interests

| Amateur photographer. Teaching photography in schools in Switzerland.

| **Guinness world Record** for being part of "Largest Hand drum ensemble in the world", 2011.

| Completed a **Bachelor of Arts in Music (Tabla)** in 2010.

| Regularly climbing and hiking.