Junaid Ali

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Education

Max Planck Institute for Software Systems 2018- Current
PhD. In Computer Science

Saarland University 2013 - 2017
Masters in Visual Computing: **Top 5% out of 50** *GPA 1.2*

Selected Courses: Differential Equations in Image Processing and Computer vision, Partial Differential Equations and Boundary value problems, Machine learning, Calculus of Variations, Statistical Natural Language Processing, Vision for Graphics, Geometric Modeling.

Lahore University of Management Sciences 2007- 2011
Bachelor of Science (Honors) Computer Science: **Top 10% out of 400** *CGPA 3.5, Subject-GPA 3.6*

Selected Courses: Discrete Mathematics, Probability, Ordinary differential equations, Computer Vision, Algorithms and Advanced Programming in Java.

Projects

Max Planck Institute for Software Systems June 2018-Current
PhD student with ***Krishna P. Gummadi***

During my PhD I am working on fairness in machine learning.

- Our paper **on loss-aversively fair classification** was accepted in **AIES19**. Motivated by extensive literature in behavioral economics and behavioral psychology (prospect theory), we propose a notion of fair updates that we refer to as **loss-averse updates**. Loss-averse updates constrain the updates to yield improved (more beneficial) outcomes to subjects compared to the status quo. We propose **convex and tractable proxy** measures that would allow this notion to be incorporated in the training of a variety of linear and non-linear classifiers. We show how our proxy measures can be combined with existing measures for training **nondiscriminatory classifiers**. Our evaluation using synthetic and real-world datasets demonstrates that the proposed proxy is effective for their desired tasks.

- Our paper **on the fairness of time-critical influence maximization in social networks**, was accepted in Human-Centered Machine Learning (**HCML**) workshop at **Neurips19**. While existing algorithmic techniques usually aim at maximizing the total number of people influenced, the population often comprises several socially salient groups, e.g., based on gender or race. As a result, these techniques could lead to **disparity across different groups** in receiving important information. Furthermore, in many of these applications, the spread of **influence is time-critical**, i.e., it is only beneficial to be influenced before a time deadline. As we show in this paper, the time-criticality of the information could further exacerbate the disparity of influence across groups. This disparity, introduced by algorithms aimed at maximizing total influence, could have far-reaching consequences, impacting people's prosperity and putting minority groups at a big disadvantage. In this work, we propose a notion of group fairness in time-critical influence maximization. We introduce surrogate objective functions to solve the influence maximization problem under fairness considerations. By exploiting the **submodularity** structure of our objectives, we provide computationally **efficient algorithms with guarantees** that are effective in enforcing fairness during the propagation process. We study the disparity in influence and demonstrate the effectiveness of our approaches through extensive experiments using synthetic datasets and a real-world dataset. We plan to submit the full paper at KDD 2020.

- Our paper **on unifying model explanability and accuracy through reasoning labels** was accepted in Safety and Robustness in Decision Making (**SRDM**) workshop at **Neurips19**. we draw upon the insight that in many situations model explainability is a means to assess another related yet distinct criterion - model robustness. In order to render the link between explainability and robustness more explicit, we propose to use **human-understandable reasoning labels** during the training process of DNNs. The reasoning labels are jointly learned with the traditional classification labels. This joint training enables the model to predict a set of reasoning labels with every predicted class label. Then, we tie model **explainability and robustness** by introducing a notion of prediction consistency, whereby the model predictions are accepted—or considered robust—only when the predicted class and the predicted reasoning labels follow a certain pre-specified mapping. We show that by adopting such a framework, one can improve the classification accuracy of the state-of-the-art models (on consistent samples). We further show that using this notion of consistency makes the model more robust to adversarial perturbations. We plan to submit the full paper at ICML 2020.

- **Currently** I am working on fairness and biases in **generative models**. I am also interested in using **reinforcement learning** to nudge a population towards a fair feature distribution.

Max Planck Institute for Software Systems May 2017-May 2018
Intern with ***Manuel G. Rodriguez***

I worked on modelling temporal point processes combining **variational autoencoder** with **recurrent neural networks**. The goal was to generate **marked temporal point processes** data automatically.

- I derived the mathematical formulation of the problem.
- I implemented the set up using TensorFlow library.
- Statistical tests, such as time rescaling theorem, and MLE of parameters show that our approach was successful.

Max Planck Institute for Informatics March 2014-March 2017
Research Assistant with ***Karol Myszkowski***

I investigated the relationship between different framerates and perceived speed.

- I did extensive literature survey to identify the factors which affect speed perception. I used these factors to design 3 **psychophysical experiments** to separate the **effect of framerate on speed perception**.
- Using OpenCV library, I calculated **optical flow** of the video sequences.
- Using CUDA support for OpenCV, I was able to **interpolate frames** real time at 60 fps. This process gave us full control over the speed of the video which helped us gauge the perceived speed changes with changes in framerate.

I have also worked on **flicker perception** and its relationship with framerates

- Using existing research, I built a model to evaluate flicker perception.
- I proposed a novel application using the flicker model to set per-pixel frame rate to achieve any amount of flicker. I formulated this problem as an optimization problem.

Max Planck Institute for Informatics
Research Assistant with ***Christian Theobolt*** August 2015-January 2016

I worked on a project to improve the results of **3D face reconstruction** from monocular videos.

- My task was to understand the existing 3D reconstruction framework, and literature related to **vibration modes**, or Eigen functions of hessian of the **flexural energy**.
- I implemented the Eigen functions and hessian computation, using libraries such as, Eigen, Adolc, OpenMesh and ANN.
- Then, I integrated the new bases, replacing the Laplace bases, in existing framework which yielded more accurate reconstruction.

Nosh Genie August 2012-June 2013
Co-Founder
Social recommendation engine for food.

- Developed and conceived the idea.
- Designed features
- Developed Marketing strategy and competitive analysis.
- Developed cellphone applications for Android and Nokia platforms.

Anahata Solutions January 2011-June 2012
Developer

Besides developing android and Samsung TV application, I also helped train interns in programming at the company.

Lahore University of Management Science January 2011 -July 2012
Research Assistant

During this job I worked on automated nodules detection in lungs.

- We worked in collaboration with Shaukat Khanum Cancer hospital. The first stage was to construct 3D model of lungs from CT images using mutual information.
- We used **morphological filters** to distinguish cancerous nodules from healthy tissue.

Honors and Awards

MLSS London: 11.6 % acceptance rate out of **1200** applicants. 2019

Machine learning summer school is a prestigious and very competitive summer school. It includes lectures by some of the world's leading experts.

Fulbright Scholarship (declined): **Less than 200 students** from a nationwide population of **200 million**. 2013

I was awarded Fulbright scholarship for masters in computer science at Stony Brook university, however I chose not to avail the opportunity. The scholarship includes full tuition waiver and living stipend for the duration of study.

Plan9 Tech Incubator: 14 teams were selected from a nationwide population of **200 million**. 2012- 2013

Our start-up Nosh Genie was selected in Plan9, a tech incubator. After rigorous testing and pitching sessions, 14 teams were selected. This incubation included free office space, stipend money, laptops, mentoring session and marketing support.

International Conference on Machine Vision Project Competition: 1st prize **out of 30 teams**. 2012-2013

We presented our bachelor's computer vision course project at ICMV. The project was a video editing. In this project we first performed color-based feature tracking in consecutive video frames. We then used the tracked points to place warped input images on those points generating effects like moving pictures in a newspaper, as in Harry Potter films.

National Outreach Undergraduate Scholarship: 50 students from a nationwide population of **200 million** 2007-2011

My undergraduate studies were funded during 4 years by the university, through the program named National Outreach Program (NOP). In this program few talented students in need of financial assistance are funded by the university as long as they maintain a certain GPA.

Academics Award: Top 5% out of 110 students 2005

Received award for academic performance in high school.

Teaching

Teaching Assistant for **Human Centered Machine Learning**
http://courses.mpi-sws.org/hcml-ws18/

Programming

Python, C++, TensorFlow, OpenCv, Java, Matlab

Languages

English, Urdu and basic German