Ameya Patil

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Research Interests

My research area is Interactive Data Visualization and Analysis, which includes a mix of databases, data visualization and human-computer interaction. Specifically, my focus is on building interactive visualization and analysis systems for environmental contexts. Additionally, I am also interested in visualization perception research, specifically regarding uncertainty visualization.

Education

University of Washington, Seattle (UW) — WA, USA
Ph.D. in Computer Science, Advised by **Dr. Leilani Battle**, GPA: 4.00/4.00 — Sept 2021 - Present

- **Research Interests:** Interactive Data Analytics for environmental sciences, Information Visualization, Computer Graphics
- **Relevant Coursework:** Computing for Conservation

University of Maryland, College Park (UMD) — MD, USA
Ph.D. in Computer Science, Advised by **Dr. Leilani Battle**, GPA: 4.00/4.00 — Jan 2021 - May 2021

- **Research Interests:** Interactive Data Analytics, Information Visualization, Computer Graphics
- **Relevant Coursework:** Game Design

University of Maryland, College Park (UMD) — MD, USA
M.S. in Computer Science, GPA: 3.84/4.00 — Aug 2018 - Dec 2020

- **Relevant Coursework:** Machine Learning, Geometric Computer Vision, Advanced Computer Graphics, Physically Based Modelling, Simulation & Animation, Interactive Data Analytics, Computational Geometry, Interactive Technologies in HCI, Database System Architecture and Implementation

Birla Institute of Technology and Science - Pilani (BITS) — Goa, India
B.E. (Honors) in Computer Science, GPA: 8.24/10.00 — Aug 2012 - May 2016

- **Electives:** Data Mining, Data Storage Technologies and Networks, Creative Multimedia

Publications

1. A. Patil, G. Richer, C. Jermaine, D. Moritz, J.-D. Fekete, "Studying Early Decision Making for Progressive Bar Charts", IEEE Transactions on Visualization and Computer Graphics, 2023. DOI: 10.1109/TVCG.2022.3209426
2. A. Aguinaldo, P.-Y. Chiang, A. Gain, A. Patil, K. Pearson and S. Feizi, "Compressing GANs using Knowledge Distillation", *CoRR, vol. abs/1902.00159, 2019. arXiv:1902.00159*

Ongoing Research

- **Reconstructing Whaling Voyages to Build Maps of Whale Density by Species** UW

  We create density maps of whale populations of different species based on a historical commercial whale hunting dataset, with the aim to create a pipelined system to facilitate whale conservation efforts. Whales are an important part of the oceanic ecosystem. However commercial whaling till the early 20th century, and fallouts of human activities both within and outside the oceans, have severely threatened whale populations. It thus becomes important to take efforts towards conservation of whales. However, we first need to understand where the whale populations were before, and where they are today, i.e. we need to understand how their numbers and dwellings have changed over time. To this end, we create a system to build visualizations of whale population densities, along with the routes taken by whaling voyages. We model the whaling data as network data, where the nodes represent locations of whale sightings and the edges represent whaling voyages. We are building a large scale data analysis system for visualizing and analyzing general purpose geographic network data which can be used to create the visualizations for whale population densities and voyage routes. The population density map coupled with the oceanic transport routes data can help us plan management activities for the conservation of whales.

- **Exploratory Visual Analysis Systems for Large Scale Graph Data** UW-UMD-MIT-Tufts

  As graphs continue to grow in scale and complexity, analysts can no longer find intuitive graph exploration and analysis interfaces that maintain interactive response times. Existing tools tend to solve a narrow slice of this problem, such as supporting only visual browsing, or only running a limited set of graph algorithms such as path-finding or attribute-based filtering. This makes it necessary for users to rely on multiple tools, and in all cases users have to know beforehand exactly how they will visualize/analyze the graph to select an appropriate approach, restricting opportunities for exploratory analysis of large graphs. To address the issue of scale and ease of graph exploration, we are working on building an integrated system for authoring scalable interactive geographical graph/network visualization and analysis interfaces, called Kyrix-G. Kyrix-G employs adaptive data reduction to jointly improve graph visualization and optimize implementations of common graph analysis tasks. Kyrix-G uses geographical graph data properties to implement DB and OLAP style optimizations to enable exploration and analysis of large graphs having several millions of nodes and edges.

Teaching

- **Head Teaching Assistant** at University of Maryland, College Park Fall 2018, Fall 2019, Fall 2020
  Computer Systems Architecture (CMSC411)

- **Teaching Assistant** at University of Maryland, College Park Spring 2019, Spring 2020
  Introduction to Data Visualization (CMSC498O)

- **Teaching Assistant** at University of Maryland, College Park Spring 2021
  Advanced Data Structures (CMSC420)

Experience

AVIZ, Inria — Saclay, France
Research Intern, advised by **Dr. Jean-Daniel Fekete** — Summer 2021

- Worked on understanding the efficacy of confidence intervals for decision making using progressive bar charts
- Proposed and studied the efficacy of two new visualization designs for progressive bar charts
- Studied the performance of humans vs automated statistical test for the task of answering questions based on progressive visualizations

Fraunhofer CESE — MD, USA
Research Assistant Intern, advised by **Dr. Marcel Schäfer** — Summer 2019

- Worked as Java developer on the PocketSecurity project which collects data to perform user behaviour analysis
- Identified and implemented critical data probes to be collected for better analysis and improved existing probes

NVIDIA — Pune, India
System Software Engineer - C/C++ — July 2016 - July 2018

- Developer for Shadowplay - a gameplay sharing app with features like record, screenshot, broadcast and coplay
- Worked on multi-threaded and multi-processes features, GPU driver code and render pipeline
- Enhanced and monitored the automated software testing suite and guided an intern for the same

NVIDIA — Pune, India
Intern — July 2015 - Dec 2015

- Device Filter Drivers - C/C++: Implemented end-to-end user input redirection from input devices to a specific application using filter drivers and device notifications
- Z-buffer - Python: Implemented aesthetic visual effects such as zoom burst using the depth data of images

Projects

- **Physically Based Clustering Visualization** — Oct 2019 - Dec 2019
  Implemented a data analysis/visualization tool with interactions modelled on real-life physical forces using the D3-Force API. The specific use case targeted was evaluating word embeddings created by different methods, where words closer in the vector space belonged to the same cluster.

- **Adding shadows to a scene using CNN** — April 2019 - May 2019
  Trained a network to generate shadows in a scene, given the scene without shadows, the depth map and the light source position map. Used the pix2pix model for the task.

- **GoRoutines vs OpenMP** — Oct 2018 - Dec 2018
  Comparatively evaluated the parallelization constructs of Go language and OpenMP using various task distribution schemes among threads. 2D image convolution operation was used for the study.

- **Data Sonification** — Jan 2016 - Apr 2016
  Investigated and implemented possible correlations between digital images and digital sounds for image encoding. Characterized aural encoding channels similar to visual encoding channels.

- **LEAP Motion App Development** — Mar 2015 - Apr 2015
  Programmed the LEAP Motion sensor to create a hand gesture based virtual music instrument dashboard. Used JAVA Swing for the UI and MIDI files for the audio.

Skills

- **Programming Languages:** C, C++, Java, Python, Javascript
- **Libraries/Frameworks:** Pytorch, OpenCV, MPI, OpenMP
- **Miscellaneous:** DSLR Photography, Adobe Lightroom

Languages

- **Marathi:** Native
- **Hindi:** Fluent
- **English:** Fluent

Extracurricular Activities

- **University of Washington, Seattle K-12** 2022
  Participated in the UW, Seattle K-12 outreach program by presenting my research work to high school students
- **Volunteer at Ekta Nagar Residents Welfare Association** 2017 - 2018
  Aided in the organisation of community activities and administrative affairs of my residential society
- **Organising Committee Member at Quark (BITS - Pilani Goa Technical Festival)** 2015
  Directed the photo and video coverage of the technical festival spanned over 3 days
- **Member at The Department of Photography, BITS-Pilani Goa** 2012 - 2015
  Performed photo and video coverage of campus events over 3 years and mentored new inductees