Deepak Narayanan Sridharan
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Education

Indian Institute of Technology (IIT) Gandhinagar July 2016 - July 2020
Bachelor of Technology with Honours, Computer Science and Engineering

Work Experience

Microsoft Research India August 2020 - Present
Research Fellow

California Institute of Technology May 2019 - July 2019
Summer Undergraduate Research Fellow

Publications

1. **Polire - A toolkit for spatial interpolation and sensor placement**
   S. Deepak Narayanan*, Zeel Patel*, Apoorv Agnihotri, Nipun Batra
   Under Review

2. **Active Learning for Air Quality Station Deployment**
   S. Deepak Narayanan, Apoorv Agnihotri, Nipun Batra
   Workshop on Real World Experiment Design and Active Learning
   International Conference on Machine Learning (ICML), 2020

3. **[Re] One ticket to win them all: generalizing lottery ticket initializations across datasets and optimizers**
   Varun Gohil*, **S. Deepak Narayanan***, Atishay Jain*
   ReScience C, Volume 6, May 2020, Part of NeurIPS Reproducibility Challenge, 2019

Research Projects

1. **Scalable fine-grained estimation of air quality using multi-modal data**
   Advisor: Prof. Nipun Batra August 2018 - April 2020

   - Air quality is affected by dynamic spatiotemporal factors like weather, wind speed, humidity, temperature, points of interest, traffic etc.
   - To model air quality effectively by incorporating these factors, I proposed using Gaussian Processes, because of their ability to encode domain knowledge by supporting custom kernels.
   - I empirically demonstrated via extensive experimentation on a real world dataset that the proposed approach outperforms several state-of-the-art approaches.

2. **Active learning for air quality station deployment**
   Advisor: Prof. Nipun Batra August 2018 - April 2020

   - Air quality monitoring is extremely sparse in many developing countries due to the expensive nature of sensing equipment. This often leading to poor estimates of air quality at unmonitored locations.
   - To alleviate this monitoring problem, I proposed an active learning scheme to choose informative locations for station deployment.
   - I empirically demonstrated that the air quality estimates obtained after using the proposed scheme were comparable to several baseline algorithms.
   - This work was presented at the ICML 2020 Workshop on Real World Experimental Design and Active Learning.

3. **Deterministic coresets for k-means clustering**
   Advisor: Prof. Anirban Dasgupta August 2019 - January 2020

- Coresets are summaries of datasets such that algorithms computed on coresets are competitive to algorithms computed on the entire dataset.
- Coreset constructions are usually randomized, with theoretical guarantees holding true in expectation. My aim in this project was to construct deterministic coresets for the k-means clustering problem.
- I proposed deterministic sampling algorithms using variants of algorithms such as priority sampling, leverage score sampling and importance score sampling.
- I empirically demonstrated that the proposed algorithms are competitive to their randomized counterparts.

4. **Analyzing streams of data: Applications in Acoustics**
   Advisor: Prof. K. Mani Chandy May 2019 - July 2019

   - Data streams are ubiquitous today. One major challenge in processing streams is that most software libraries operate on fixed data whereas streams continue forever.
   - IoTPy is a software, developed at Caltech, that enables use of software designed for fixed data for endless streams. My aim in this project was to build acoustic applications using IoTPy.
   - I recreated the shimmer acoustic effect produced by expensive copyrighted guitar pedals, along with building several other applications.

Software

1. **Polire: A toolkit for spatial interpolation and sensor placement**

   - Sensing is central to the Sensys and related communities. However, despite recent advancements, fine-grained spatial sensing remains a challenge, owing to cost, maintenance, among other factors. Thus, estimating the sensed phenomenon at unmonitored locations and strategically installing sensors is of prime importance.
   - Polire is a toolkit that help reduce the barrier for sensor deployments by providing a suite of algorithms for spatial interpolation and sensor placement.
   - I am a core contributor to Polire, and implemented several spatial interpolation algorithms such as IDW, Natural Neighbors, Kriging, along with state-of-the-art sensor placement algorithms.

2. **IoTPy: A Python Package that helps build applications that operate on streams of data**

   - IoTPy is a software built at Caltech to build modular applications that process streams of data.
   - My contributions involved refactoring the repository, packaging the software, writing tests and creating example notebooks for the latest release.
   - The latest release of IoTPy was presented at EuroPython 2020. I was a co-author in this presentation.

Achievements and Honours

1. Awarded Dean's List for all the semesters from 1 to 6 at IIT Gandhinagar for exceptional academic performance.
2. Awarded the prestigious Summer Undergraduate Research Fellowship (SURF) by Caltech to conduct research with Prof. K. Mani Chandy for Summer 2019.
3. Awarded the prestigious Summer Research Fellowship by the Indian Academy of Sciences to conduct research with Prof. Sudarshan Iyengar, IIT Ropar for Summer 2018.
4. Recipient of the prestigious National Talent Search Examination Scholarship, awarded by the Government of India since 2014.
5. Selected for the prestigious KVPY Fellowship, awarded by the Department of Science and Technology, Government of India in 2016.
6. Invited to attend Microsoft's AI for Earth Summit at Microsoft Redmond in May 2019.
7. Awarded Microsoft AI for Earth Grant in 2018 worth $15,000. I assisted Prof. Nipun Batra in writing the grant.

References

Available upon request.