VIVEK BAGARIA

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EDUCATION

STANFORD UNIVERSITY
PhD in Elec. Engineering
2020
Scalable Machine Learning
Advisor: **David Tse**

Masters in Statistics
2018
Specialization: Data Science

IIT MADRAS
B. Tech in Electrical
Engineering
2010-2014

COURSEWORK

Deep Learning in CV
Applied Statistics
Convex Optimization
Data Structures and Algorithms
Matrix Estimation
Blockchain
Cryptography
Randomized Algorithms
Theory of Probability
Signal Processing
Design of Control Systems
Modern Coding Theory

SKILLS

PROGRAMMING
C++ • Rust • Python • Scala
Java • R • Matlab • Docker
AWS

LINKS

Github • LinkedIn

INTERESTS

I like designing algorithms, implementing scalable systems and integrating them all the way to the final product. My interests are in areas of machine learning, fast algorithms and statistics.

PROJECTS

NEAREST NEIGHBOURS, K-MEANS AND MEDOIDS IN LINEAR TIME We designed and implemented a framework which can compute nearest neighbors to n points in d dimensions in $O(n \log d)$ time. Using this framework, each iteration of lloyd's k-means algorithm can be computed $O(nk \log d)$ time and median in high-dimensions of n points can be computed in $O(nd \log n)$ time.

BOOMERANG: IMPROVING PAYMENT NETWORKS USING REDUNDANCY
We use Shamir secret-sharing to add redundancy on multi-path payments on Bitcoin lightning network which improves the transfer latency and throughput by 2x.

SOLVING TRAVELLING SALESMAN PROBLEM IN QUADRATIC TIME
We designed a linear program that solves the most instances of travelling salesman problem in $O\left(|Vertices||Edges|\right)$ time.

ADAPTIVE DATA SCIENCE: BIAS REDUCTION VIA SAMPLING
In the regime of adaptive data analysis, we study the reduction in bias and increase in privacy from sub-sampling.

PRISM: DECONSTRUCTING THE BLOCKCHAIN TO PHYSICAL LIMITS
We design, Prism, a blockchain consensus protocol which achieves optimal throughput and near optimal confirmation latency. Full stack implementation of Prism achieves $70,000$ transactions per second with 30 second confirmation latency.

OPTIMALLY APPROXIMATING LIFETIME OF WIRELESS SENSOR NETWORK
We design an optimal approximation algorithm which maximizes the lifetime of coverage of targets in a wireless sensor network with battery-limited sensors. This algorithm is optimal for the online version of the problem.

SELECTED PREPRINT AND PUBLICATIONS

- Adaptive Monte-Carlo Optimization (preprint)
- Prism: Scaling Bitcoin by 10,000x (preprint, Arxiv)
- Deconstructing the blockchain to approach physical limits, CCS 2019.
- Hidden Hamiltonian Cycle Recovery via Linear Program, *Operations Research 2019*
- Medoids in almost linear time via multi-armed bandits, *AISTATS 2018*
- Optimally approximating the coverage lifetime of wireless sensor networks, *IEEE/ACM Trans. on Networking*
- The online disjoint set cover problem and its applications, *INFOCOM 2015*
- Maximizing utility among selfish users in social groups, *NCC Kanpur 2014*

INDUSTRY EXPERIENCE

APPLIED PROTOCOL RESEARCH Blockchain Scientist Jul-Dec 2018
Designed and implemented a full stack consensus protocol, Prism, which achieves $70,000$ transactions per second (tps) with 30 second confirmation latency.

HUMAN LONGEVITY Machine Learning Scientist Jul-Aug 2017
Developed a pipeline to determine if cancer the drug *pembrolizumab* should be administered to a patient using their genome.

GOLDMAN SACHS Quant Strategist Jan-Sep 2015
Used machine learning on stock and bond price data to develop mutual funds investment strategies.

AWARDS

Ranked 3rd out of 80 in the EE PhD Qualifying Exam, Stanford University, 2016.