VIVEK BAGARIA

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EDUCATION

STANFORD UNIVERSITY

PhD in Elec. Engineering
2020 (expected)
Blockchain & Machine Learning
Advisor: David Tse

Masters in Statistics
2018
Specialization: Data Science

IIT MADRAS

B. Tech in Electrical Engineering
2010-2014

COURSEWORK

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

SKILLS

PROGRAMMING

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

LINKS

Github • LinkedIn

INTERESTS

I design and build systems in the areas of blockchains, cryptography and distributed systems. I am also interested in Algorithm design, High dimensional statistics and Machine learning.

PROJECTS

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.

BOOMERANG: IMPROVING PAYMENT NETWORKS USING REDUNDANCY

We use Shamir secret-sharing to add redundancy on multi-path payments on Bitcoin lightning network which reduces the transfer latency by 3x.

NEAREST NEIGHBOURS, K-MEANS AND MEDOIDS IN LINEAR TIME

We design and implement 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.

SOLVING TRAVELLING SALESMAN PROBLEM IN QUADRATIC TIME

We show that the most of the instances of travelling salesman problem can be solved using a linear program in $O\left(|Vertices||Edges|\right)$ time.

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

- Deconstructing the blockchain to approach physical limits (To appear in CCS 2019)
- Hidden Hamiltonian Cycle Recovery via Linear Program, *Operations Research 2019*
- Adaptive Monte-Carlo Optimization (preprint)
- 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.
- Added sharding on Prism to obtain $250,000$ tps with 6 shards.
- Designed longest chain based Proof of Stake version of Prism with same performance.

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 prices to develop mutual funds investment strategies.

AWARDS

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