Shivam Patel

patelshivam99@gmail.com

EDUCATION

NIRMA UNIVERSITY
BTech in Computer Engineering
Expected May 2020 |Gujarat,India

ST. XAVIER'S LOYOLA HALL
Grad. May 2016|Ahmedabad, India

LINKS

Github:// **Shivamshaiv**
LinkedIn:// **shivam-p-8b7b3585**
Quora:// **Shivam-Patel-32**

SKILLS

PROGRAMMING

Over 10000 lines:
• Python • C • C++ • Java
• Mathematica • Matlab • Javascript
Over 2000 lines:
• CUDA • Hadoop • CSS
• PHP • Android
Deep Learning:
• Tensorflow • Keras • Caffe
• Pytorch • PySpark • TfLearn
Operating systems:
• Windows • Unix • Linux
Familiar:
AS3 • iOS • Assembly • MySQL
Design tools:
• Adobe Photoshop • SolidWorks
• Blender • CorelDraw

COURSEWORK

ONLINE

Introduction to MATLAB Programming
Practical Programming in C:MIT
Programming Paradigms:Stanford
Introduction to Algorithms: MIT
Cryptography I & II :Stanford
Artificial Intelligence:MIT
(And over 120 others)

OPEN SOURCE PROJECTS

TensorFlow : Feature addition
Keras : Feature addition
OpenCV 3:Feature addition
DeepCell : Feature addition
tfRetinanet : Converted to tf.keras
GTText : Optimization
Matplotlib : Bug Fixes
Project Jupyter : Bug Fixes
Mozilla : Front End
(And so many more ...)

RESEARCH INTERNSHIPS

UNIVERSITY OF CAMBRIDGE |Deep Reinforcement Learning & Computational Social Science
Jan 2020 | Cambridge, United Kingdom

Working on my undergraduate thesis under the guidance of Dr Shahar Avin and Dr Jess Whittlestone at the Centre for the Study of Existential Risk. Here I developed a family of highly scalable and customizable agent-based models of AI research to understand the epistemology of machine learning research and how various factors like funding, research resources, hype and regulation impact it. These models were developed to have various deep reinforcement learning algorithms and game theoretic heuristics as a part of their decision making routines. Useful optimization techniques were developed to make them a useful computational tool for policy researchers, computer scientists, social scientists and philosophers.

MILA - QUEBEC AI INSTITUTE |Deep Reinforcement Learning
May 2019 to Sep 2019| Montreal, Quebec, Canada

Worked with the Climate Change AI group at MILA : supervised by the Turing Laureate Prof Yoshua Bengio and Dr S. Karthik Mukkavilli. My work focused on building multi-agent deep reinforcement learning frameworks in modelling economies and their impact on climate change. I proposed a novel agent based integrated assessment model which uses deep reinforcement learning to better align the actions of economic agents to their impacts on the climate.This pioneering line of work combining agent-based modelling with reinforcement learning in application to policy discovery was appreciated by scholars from Harvard,Oxford ,Columbia, Waterloo and various other institutions.

CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH) |Deep Learning for Biological Imaging
May 2018 to Aug 2018|Pasadena,California,USA

Invited by Prof David Van Valen at Caltech for research in implementation of novel deep learning techniques in single cell imaging experiments. Our lab collaborated with Prof Marcus Convert's Lab at Stanford University for the collection of live microscopic cell imaging data.I worked on designing novel approaches for cell detection and cell segmentation .This included the modifications of existing algorithms for optimum results and I also proposed a segmentation neural network which outperforms the current state of the art for cell segmentation. My work contributed towards the development of Deepcell :enabling deep learning based biological image analysis in the cloud.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY |Statistical Machine Learning
June 2017 to Aug 2017|Cambridge,Massachusetts,USA

Invited by Prof.
Gilbert Strang for research work in mathematical formulation of deep learning models - methods to formalize neural networks using statistical tools and tensor decomposition methods. We gave theoretical reasons for the unreasonable effectiveness of deep architectures from shallow ones. Was invited to write a chapter in his upcoming book.

INVITATIONS

INSTITUTE OF MATHEMATICAL SCIENCES |Invited by director Prof Balasubramanian

19 to 21 January 2014 | Chennai, India

Invited to discuss the progress made by him in q -series, prime counting functions and algorithms related to finding closed form expressions for integrals.Discussed novel methods in computing the number theoretic partition function and the methods in asymptotic number theory as a whole. Also took a seminar titled " Computation of Some Integrals" for the Faculties of the Institute"

TATA INSTITUTE OF FUNDAMENTAL RESEARCH | Invited by Professor Dipendra Prasad

8 to 10 Oct 2013 | Mumbai , India

Invited to present and discuss my research work in Ramanujan mathematics , more specifically analytical number theory. Explored various properties on application of computer aided mathematical research with an emphasis on conjecture verification, automated mathematical proving along with pattern recognition.

ACHIEVEMENTS

ICM 2014 -SEOUL | Youngest person to get abstract accepted

13 to 21 August 2014

- Abstract titled "New Families of Rogers Ramanujan Continued fractions" was accepted International Congress of Mathematics at age 15.

ANNUAL STATE CONFERENCES | Invited Twice as a Speaker

14th Nov 2013 & 25th Dec 2016

- Delivered a lecture on "Ramanujan Mathematics" and on "PI Matters" in 50th and 53th Annual State Mathematics Conference respectively.

TED TALKS | Invited twice as a Speaker

22 April 2017

- Delivered a Tedx talk on "Classrooms Beyond Boundaries" exploring themes of online education,the future and role of distributed computing projects.
- Delivered a second Tedx talk on "The AI:Dilemma" exploring the past present and future of artificial intelligence with an emphasis on medicine and appealed the doctors to collaborate with computer scientist to shape a better future of medical AI.

ERDOS NUMBER 2 | Youngest person to receive

- Collaborated with the Hungarian mathematician Mih´aly Bencze for "Asymptotic analysis on primes in a certain form" to receive Erdos number of 2.

COMPUTATION OF π | Highest computation without GPU

- Computed 3.3 trillion decimal digits of π .

INDUSTRY EXPERIENCE

GROK VIDEO |Research Scientist

Feb 2020 - Present| Montreal, Quebec, Canada

Developing highly scalable deep learning techniques for semi supervised semantic multimedia retrieval, incorporating ideas from Metric Learning, Weakly supervised Learning and Computer Vision. Devised a novel text-video-audio embedding which improves perfomance on down stream tasks by over 1%. Also handled the scalable deployment of these workflows using Kubernetes and Apache Hadoop.

TAIYO LLC |Research Scientist

Feb 2020 - Present| Montreal, Quebec, Canada

Focusing on the development of low latency stock trading pipelines leveraging state of the art deep learning architectures and statistical techniques with Python, C++, AWS, Kubernetes and Docker.Also designing custom storage architectures, for achieving low latency and designing the framework for extensive backtesting of forecasting algorithms and strategies.

SUSTLABS, IIT BOMBAY |Data Science Intern

Nov 2018 - Feb 2020| Mumbai,India

Worked on the development of an IOT based smart metering device to collect electricity consumption data to over 100 times every second. Developed and implemented algorithms to improve the analysis and feedback from the billions of data points collected. Developed and implemented novel temporal neural network architectures to perform near real-time non-intrusive load monitoring.

QUIPH |Natural Language Processing and Computer Vision Intern
Aug 2017 - Oct 2018| Manglore,India
Worked on a problem that involved tracking fast moving objects. Devised an algorithm based upon neural networks like architectures along with genetic algorithms and implemented it on the hardware using OpenCV and embedded C . It gave tracking efficiency of about 97% . Another project was automatic language detection which I employed Recurrent Neural Networks and CNNs for an algorithm and implemented it with a system having over 200 languages and trained it with 108GB dataset it gives better than state of the art accuracy and I wrote a paper which is under review.

MISCELLANEOUS

OTHER NOTABLE ACCOMPLISHMENTS |Scholarships,Honours,Felicitations

- Visiting Undergraduate Research Fellowship(VURP) by Caltech for pursuing a fully funded research internship at Caltech in the summer of 2018.
- Felicitated by The Income Tax Bar Association as " Promising Gujarati"
- Received the responsibility to develop only existing Ramanujan museum in the world" which from the government of Tamil Nadu.
- Given rare access to the original handwritten manuscripts of Srinivas Ramanujan to read , study and examine for 4 days during his visit at Indian Institute of Mathematical research.
- The world record of highest number of decimal digits of π calculation on a GPU uaided computer.
- Invited by IIT Bombay as a speaker in international conference on Python in Scientific Programming (Scipy 2017).

COLLABOARATIVE RESEARCH PROJECTS

DIGITAL PHENOTYPING FOR MENTAL HEALTH |University of Montreal
Collaborating with Prof Pierre Orban developing robust forecasting methods in digital phenotyping which can scale to large datasets and also have performance robust to sparsity and data corruption. Specially developing techniques focusing on explainablity of the prediction and personalization to the individual patient.

DEEP LEARNING FOR EARTH SCIENCES |Lawrence Berkeley National Laboratory
Working with Dr S. Karthik Mukkavilli developing deep learning techniques suitable for applications in Earth Sciences. Including developement of PyDICEx - a robust, modular, extensible python package for precise simulation of Integrated Assessment Models developed upon the DICE framework. Wrote highly efficient C++/Cython routines for stochastic non-linear optimization. Currently working on an agent based analogue, on top of python library MESA and supports multi-RL based decision making routines and has an OPEN AI Gym like API for experimentation

ULTRA CRYOGENIC ATOM ANALYSIS |MIT, Harvard University
Developing Computer Vision techniques based on state of the art machine learning models , for the analysis, noise reduction and segmentation an of images of ultra-cold atoms from the Noble Prize winning experiments in the lab of Prof. Wolfgang Ketterle , collaborating with Prof Martin Zwierlein at MIT-Harvard Center for Ultracold Atoms.

BURN PROGNOSIS USING DEEP LEARNING |Stanford University
Working on the improvement of the current deep learning models in early burn diagnosis , using innovative architectures like use of fully connected layers and their variants on the BURNED dataset provided by Stanford University . Also under the guidance of Orion Despo working for multiburn image analysis.

GLOBAL CLIMATE DATA ANALYSIS |Berkeley Earth(Lawrence Berkeley National Laboratory)
Implementing data mining techniques -to mine the climate data from various parts of web . Along with this also Developing innovative analysis and comparison methods for interpretation and presentation of the data.Working with and under the guidance of Dr Robert Rhode.

DEEP LEARNING POWERED FINANCIAL MATHEMATICS |University of Toronto
Working with team of undergraduates in the Statistics department of University of Toronto , for the applications of deep learning algorithms in extremely dynamic and financial applications . Tested various methods in prediction of stocks , rates of currencies, cryptocurrencies currently focusing on Algo Trading with deep learning.

POLARIMETRIC DATA ANALYSIS FROM RISAT-1 |ISRO (Indian Space Research Organization)
Working on developing tools to store , process understand the polarimetric big data obtained by the satellite . Deploying various algorithms for the segmentation of the images converted from the data. Also implemented an improved version of Wishart Classifier which outperforms the state of the art methods of object and oil spill detection .

CS PROJECTS

DeepCell	Contributor	Implemented neural networks Python Library of live segmentation segmentation
Golly	Co-creator	Open source platform for cellular automata aided with various rules.
Powder Toy	Developer	A 2-D sandbox particle stimulator game written in Lua.
Gazebo	Programmer	Contributed in programing this massive open sourse robotics project.
Algoodo	Contributor	A 2-D physics stimulator
Blender	Contributor	Added efficient hair rendering algorithm
SKData	Contributor	Added to this library of Machine Learning and Statistics
FANN	Contributor	Fast Artificial Neural Network Library which implements multilayer ANNs in C.

MATHEMATICS AND COMPUTING PROJECTS

Computation of π	Computed 3.3 Trillion Decimal Digits- Discovered a quaternary converging recurrence algorithms.
Ramanujan methods	Discovered multiple families of Ramanujan type hyper geometric series for π and their generalization.
GIMPS	Involved in the discovery of last 2 Mersenne Primes through the GIMPS Project.
PrimeGrid	Discovered the currently the 2^{nd} largest repunit prime and several other types .
OEIS	Contributed over 4200 sequences in the Online Encyclopedia of Integer Sequences.
Orbit@Home	Developing statistical models to identify the best places to identify near-Earth asteroids.
Mathematica	Developed over 10 demonstrations on the Wolfram CDF Player coding in Mathematica .
Wikipedia	Contributed in over 2000 articles in Wikipedia, Wikia and Wiki Quotes.

INVITED TALKS

Univerity of Oxford	Invited to the OII to deliver a talk on multi-agent RL in computational social sciences.
Stanford University	Invited to the department of computer science for a graphics talk about efficient 3D hair rendering.
Scipy India 2017	Delivered a talk and conducted a workshop titled Next Generation Number theory and optimization .
Data Science Week	Conducted a 5 day workshop on Mathematical and Implementations aspects of Data Science.
St Xaviers College	Delivered a talk on "Chess Meets Mathematics" which is on game theory aided with Machine learning.
Techfest IEEE	Conducted a two days workshop covering the basics to the advanced level of Data science in Python.
St Xaviers College	Talk on "Internet and Mathematics"on various internet aided tools for effective math research.
Tedx Nirma	"Classrooms beyond Boundaries" on the impact of online education and communities.
Tedx NHL	"The AI Dilemma" which explores relationships of upcoming AI Technologies with Medicine

· · · And in many other conferences , gatherings and meet-ups.

BOOKS WRITTEN

- Glimpses of Ramanujan's mathematics - Under Review in American Mathematical Association .
- Mathematics of Nature and Nature of Mathematics -Writing it with Amarnath Krishnamurti.

PUBLICATIONS

- "Accelerating Unsupervised SAR Polarimetric Image Segmentation by Parallel Wishart Classifier" with Rohan Desai and Pooja Shah ,GPU Technology Conference 2020 , San Jose,CA,USA
- "LangDetectNet:Spoken Language Detection using parallel trainable Deep RCNN Architectures." GPU Technology Conference 2018 , San Jose,CA,USA.
- "Next Generation Compressed Domain Video Hashing Using Deep Learning and Nvdia GPU" with Ekta Jayswal , GPU Technology conference 2018,San Jose,CA,USA.
- "Computational Methods for Obtaining Unconditional Bounds for the Ramanujan's Inequality on $\pi^2(x)$, P.C Vaidya National Conference of Mathematics 2018
- "Disproof of a conjecture on d(N)" , Octagon Mathematical Magazine Volume 22. No. 1 April, 2014.
- "AM-GM –HM Triples", Octagon Mathematical Magazine. -Vol 2 No.2 Oct 2014 .

- ”S Union P is negated by F then d – Octagon Mathematical Magazine. -Vol 2 No.2 Oct 2014 .
- “Classification of number theoretic sequences involving primes and special functions “ published in Octagon Mathematical Magazine. -Vol 2 No.2 Oct 2014
- Does there exits proof with S* ”
- “Closed forms of some logarithmic integrals with irrational exponents ” published in Octagon Mathematical Magazine.-
- “Asymptotic analysis on primes in a certain form - as conjectured by M. Bencze” with M. Bencze published in Octagon Mathematical Magazine.
- “Exact formula for the number of primes in the form $4n+3 \leq x$ in terms of the Riemann R function”published in Octagon Mathematical Magazine-
- ”Representation Non Perfect Squares by Triangular numbers” published in Octagon Mathematical Magazine.- Oct 2014
- Legal:Illegal Chess Games” published in Octagon Mathematical Magazine.- Oct 2014
- ”Impossibility of construction of Fibonacci and Lucas Magic Squares (OQ. 4661)” published in Octagon Mathematical Magazine.- Oct 2014
- Application divergent Mellin transform in evaluation of series and limits of sequences” published in “The Indian Journal of Pure and Applied Mathematics
- Developed software for the article ”Maxillary and Mandibular Arch Perimeter Prediction Using Ramanujan’s Equation for the Ellipse-In vitro Study ” published in British Journal of Medicine Medical Research- Sep 2016.