Rishab Khincha

https://rishabkhincha.github.io | http://www.mit.edu/~rkhincha

EDUCATION

BITS PILANI | BEng. in Computer Science
Expected May 2021 | Goa, India

- Major GPA: 9.80 / 10
- CGPA: 9.24 / 10

BITS PILANI | MSc. in Physics
Expected May 2021 | Goa, India

- Major GPA: 9.61 / 10
- CGPA: 9.24 / 10

PUBLICATIONS AND TALKS

1. **Rishab Khincha**, Soundarya Krishnan, Krishnan Guru-Murthy, Tirtharaj Dash, Lovekesh Vig, Ashwin Srinivasan. *"Constructing and Evaluating an Explainable Model for COVID-19 Diagnosis from Chest X-rays"* . Under review.

2. Utkarsh Sarawgi, Wazeer Zulfikar, **Rishab Khincha**, Pattie Maes. *"Why have a Unified Predictive Uncertainty? Disentangling it using Deep Split Ensembles"* . Under review. **[Preprint] [Code]**

3. **Rishab Khincha**, Utkarsh Sarawgi, Wazeer Zulfikar, Pattie Maes. *"Robustness to Missing Features using Hierarchical Clustering with Split Neural Networks"* . Student Abstract - AAAI 2021. **[Code]**

4. Utkarsh Sarawgi, Wazeer Zulfikar, **Rishab Khincha**, Pattie Maes. *"Uncertainty-Aware Multi-Modal Ensembling for Severity Prediction of Alzheimer's Dementia"* . ML4H Workshop, NeurIPS 2020. **[Preprint] [Code]**

5. Soundarya Krishnan, **Rishab Khincha**, Lovekesh Vig, Tirtharaj Dash, Ashwin Srinivasan. *"A Case Study of Transfer of Lesion-Knowledge"* . 2nd MIL3D Workshop, MICCAI 2020. Springer LNCS. **[Paper] [Oral] [Slides]**

6. Kushagra Mahajan, Monika Sharma, Lovekesh Vig, **Rishab Khincha**, Soundarya Krishnan, Adithya Niranjan, Tirtharaj Dash, Ashwin Srinivasan, Gautam Shroff. *"CovidDiagnosis: Deep Diagnosis of COVID-19 Patients using Chest X-rays"* . 2nd TIA Workshop, MICCAI 2020. Springer LNCS. **[Paper] [Oral]**

7. Soundarya Krishnan, **Rishab Khincha**, Neena Goveas. *"Online Learning Assistant with Network Community Analysis"* . Accepted at the Young Researcher's Symposium, CODS-COMAD 2021.

8. **Rishab Khincha**, Soundarya Krishnan, Rizwan Parveen, Neena Goveas. *"ECG Signal Analysis on an Embedded Device for Sleep Apnea Detection"* . 9th International Conference on Image and Signal Processing, Morocco. **[Paper]**

9. **Rishab Khincha**, Pauline Barmby. *"How to do science with ImageCube"* . *Invited hour long talk at PyAstro 2020, Trinity College Dublin. Cancelled due to COVID-19*

EXPERIENCE

MIT MEDIA LAB | Research Affiliate
June 2020 – Present | Cambridge, USA

- Writing senior thesis under the supervision of **Prof. Pattie Maes** at the **Fluid Interfaces** group.
- Building **fair and aware AI** algorithms to aid **healthcare** and **human cognition** to build reliable decision making systems. Project page - **dementAI**

GOLDMAN SACHS | Summer Analyst
May 2020 – June 2020 | Bangalore, IN

- Worked in the **Loans Servicing** team to build a loan reconciliation app using Java, BPMN and eTasks.
- Received **return offer** to join full time based on the project performance.

APPCAIR & TCS RESEARCH | Student Researcher
Jan 2020 – Current | Goa, IN

- Building **robust** and **interpetable** models for **medical imaging** under the supervision of **Prof. Ashwin Srinivasan** and **Dr. Lovekesh Vig**.
- Working on multiple projects involving identifying **COVID-19** from Chest X-rays and **lesion classification**.

WESTERN UNIVERSITY | MITACS Globalink Research Intern
Prof. Pauline Barmby | May 2019 – August 2019 | London, ON

- Worked on building **ImageCube**, an **image processing** tool that processes multi-wavelength astronomical datasets.
- The package is built on the latest versions of Python and Astropy and it registers images from different telescope to a common World Coordinate System, convolves and re-samples them to a common pixel scale.

MYRA MEDICINE | Data Science Intern
Mr. Manik Singhal | May 2018 – July 2018 | Bangalore, KA

- Analyzed customer order data and introduced a bucket system to **profile customers** based on various purchasing patterns.
- A **detailed report**, backed with data was presented to the marketing team based on the analysis and the findings were used for various **targeted campaigns** and **advertisements**.

VOLVO CE | Summer Intern
Mr. Sundara Murthy | May 2017 – July 2017 | Bangalore, KA

- Analyzed various models implemented in the supply chain management and provided technical solutions to improve productivity and efficiency.
- Developed an **Android application** for inventory handling used internally in the warehouses, which resulted in nearly **100%** accuracy in materials reaching the assembly line.

SELECTED PROJECTS

EXPLAINABLE MODELS FOR COVID-19 DIAGNOSIS FROM CHEST X-RAYS
Prof. Ashwin Srinivasan, Dr. Lovekesh Vig | APPCAIR
August 2020 – Present

- Propose a new **COVIDr dataset** with important radiological annotations from a **practising radiologist**.
- Build a deep **neuro-symbolic** model to diagnose **COVID-19** from chest X-rays and provide **visual** and **textual explanations**.
- We find that the radiologist prefers **simple representations**, both visual and textual to aid in diagnosis.

DISENTANGLING PREDICTIVE UNCERTAINTIES USING DEEP SPLIT ENSEMBLES
Prof. Pattie Maes | MIT [Preprint] [Code]
June 2020 – September 2020

- Propose a conceptually simple non-Bayesian approach, ***deep split ensemble***, to disentangle the **predictive uncertainties** using a multivariate GMM.
- Extensive analyses using dataset shits and empirical rule highlight our inherently **well-calibrated** models.
- Demonstrate its applicability in a **multi-modal** setting using a benchmark **Alzheimer's** dataset and show how it can highlight hidden modality-specific **biases**.

UNCERTAINTY-AWARE ENSEMBLING FOR SEVERITY PREDICTION OF ALZHEIMER'S DEMENTIA
Prof. Pattie Maes | MIT [Preprint] [Code]
September 2020 – Present

- Propose an **uncertainty-aware boosting** technique for multi-modal building an ensemble system robust to heteroscedasticity in the data to predict Alzheimer's Dementia Severity.
- Weighing the different modalities based on the uncertainty estimates, we experiment on the benchmark **ADReSS dataset** to show that our method outperforms the **state-of-the-art** methods while also reducing the overall **entropy** of the system.

KNOWLEDGE TRANSFER IN LESIONS
Prof. Ashwin Srinivasan, Dr. Lovekesh Vig | APPCAIR
January 2020 – June 2020

- Studied the **transfer of lesion knowledge** across organs for lesion classification tasks.
- Showed that **transfer learning** using **lesion-augmented** models perform substantially better than models trained using **random weights** or **lesion-agnostic** (like ImageNet) transfer.

ROBUSTNESS TO MISSING FEATURES USING HIERARCHICAL CLUSTERING WITH SPLIT NEURAL NETWORKS

Prof. Pattie Maes | MIT [Code]
August 2020 – October 2020

- Proposed a simple yet effective approach that clusters similar input features together using **hierarchical clustering** and then trains proportionately **split neural networks** with a joint loss.
- Evaluated this approach on a series of benchmark datasets and show **promising improvements** even with **simple imputation** techniques.

PORTABLE HOLTER MONITOR WITH REAL TIME THREAT DETECTION

Prof. Neena Goveas | BITS Goa
Jan 2019 – April 2019

- Developing a **low cost**, **portable** holter monitor that could be potentially used by soldiers working in remote conditions to detect conditions like **breathlessness** and **fatigue**.
- Created models for the detection of **sleep apnea** from real time ECG data and achieved an accuracy of **90%** using SVMs.
- Wrote scripts on a Raspberry Pi for processing the data from the hardware to run the model for **real-time** threat detection.

COVIDDIAGNOSIS: DEEP DIAGNOSIS OF COVID-19 PATIENTS USING CHEST X-RAYS

Prof. Ashwin Srinivasan, Dr. Lovekesh Vig | APPCAIR

ONLINE LEARNING ASSISTANT WITH NETWORK COMMUNITY ANALYSIS

Prof. Neena Goveas | BITS Goa

STOCK MARKET CRASH ANALYSIS

Prof. Kinjal Banerjee | BITS Goa

TEACHING ASSISTANT

Object Oriented Programming Prof. Neena Goveas – Fall 2019
Computer Programminng Prof. Bharat Deshpande – Spring 2020, Spring 2018
Electromagnetic Theory Prof. Kinjal Banerjee – Fall 2018

RELEVANT COURSEWORK

PHYSICS

- Introduction to Astronomy and Astrophysics
- Computational Physics • Optics
- Classical Mechanics • Statistical Mechanics
- Non-linear Dynamics and Chaos
- Mathematical Methods for Physicists
- Quantum Mechanics I and II

COMPUTER SCIENCE

- Machine Learning • Artificial Intelligence
- Data Mining • Data Structures and Algorithms
- Object Oriented Programming
- Database Systems
- Logic in Computer Science
- Operating Systems

REVIEWING & MENTORING

New in ML, NeurIPS 2020 | Reviewer
ML4H Workshop, NeurIPS 2020 | Mentor
Department of CSIS, BITS Goa | Mentor

LANGUAGES

PROGRAMMING

Python • C++ • C • Java • Matlab • R • LaTeX

Libraries:
tensorflow • pytorch • opencv • sklearn • astropy
numpy • pandas • matplotlib

Version Control:
• Git

Operating Systems:
• Linux • Windows

SPOKEN & WRITTEN

Native fluency:
English, Hindi, Marwari

Reading fluency:
Kannada