

# 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". Under review. [Code]
4. Utkarsh Sarawgi, Wazeer Zulfikar, **Rishab Khincha**, Pattie Maes. "Uncertainty-Aware Multi-Modal Ensembling for Severity Prediction of Alzheimer's Dementia". Under review. [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 Niranjana, 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 **interpretable** 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 shifts 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 •  $\text{\LaTeX}$

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