

# ABHINAV KUMAR

---

<b>Contact Information</b>	<i>Email:</i> <a href="mailto:abhinavkumar.wk@gmail.com">abhinavkumar.wk@gmail.com</a> <i>Links:</i> <a href="#">Webpage</a> , <a href="#">Google Scholar</a> , <a href="#">Github</a>	
<b>Education</b>	<b><i>Birla Institute Of Technology and Science, Pilani</i></b>	2015-2020
	M.Sc.(Hons.) Physics	GPA: 9.54/10
	Thesis: Disentangling Mixtures of Unknown Causal Intervention	
	Advisor: <a href="#">Dr. Gaurav Sinha</a> , Adobe Research, Bangalore	
	<b><i>Birla Institute Of Technology and Science, Pilani</i></b>	2015-2020
	B.E.(Hons.) Computer Science	GPA: 9.54/10
	Thesis: Fine-Tuning Word Embedding for Domain Adaptation	
	Advisor: <a href="#">Dr. Partha Talukdar</a> , Indian Institute of Science, Bangalore	
<b>Work Experience</b>	<b><i>Microsoft Research</i></b> , Bangalore	07/21 - Present
	Research Fellow	
	Generalization and Explainability of ML model with Causal Perspective	
	Advisors: <a href="#">Dr. Amit Sharma</a> , <a href="#">Dr. Chenhao Tan</a> and <a href="#">Dr. Amit Deshpande</a>	
	<b><i>Paypal</i></b> , Hyderabad	08/20 - 06/21
	Software Engineer 1	
	Backend Service Development for Fraud Detection Platform	
	<b><i>Adobe Research</i></b> , Bangalore	01/20 - 07/20
	Research Intern	
	Root Cause Analysis with Causal Perspective	
	Advisor: <a href="#">Dr. Gaurav Sinha</a>	
	<b><i>Indian Institute of Science (IISc)</i></b> , Bangalore	05/19 - 12/19
	Research Intern	
	Fine-Tuning Word Embedding for Domain Adaptation	
	Advisor: <a href="#">Dr. Partha Talukdar</a>	
	<b><i>Google Summer of Code</i></b>	05/18 - 08/18
	Research Intern, CERN-High Energy Software Foundation	
	Deep Learning for Particle Detection and Energy Prediction for particle detectors at CERN	
	Advisors: <a href="#">Dr. Grasseau Gilles</a> and <a href="#">Dr. Florian Beaudett</a>	
	<b><i>Center for Astronomy and Astrophysics (IUCAA)</i></b> , Pune	05/17 - 07/17
	Research Intern	
	Efficient Computation of Gravitational Potential in N-body simulation	
	Advisor: <a href="#">Dr. Kanak Saha</a>	
<b>Publications</b>	1. <a href="#">Abhinav Kumar</a> , Chenhao Tan, Amit Sharma. “ <b>Probing Classifiers are Unreliable for Concept Removal and Detection</b> ”. To appear in 36th Conference on Neural Information Processing Systems ( <a href="#">Paper</a> , <a href="#">NeurIPS 2022</a> ).	
	2. <a href="#">Abhinav Kumar</a> , Gaurav Sinha. “ <b>Disentangling mixtures of unknown causal interventions</b> ”. Proceedings of the Thirty-Seventh Conference on Uncertainty in Artificial Intelligence ( <a href="#">Paper</a> , <a href="#">UAI 2021</a> ) [ <a href="#">Oral</a> , 6% acceptance rate].	

3. Gilles Grasseau, [Abhinav Kumar](#), Andrea Sartirana, Artur Lobanov and Florian Beaudette. “A deep neural network method for analyzing the CMS High Granularity Calorimeter (HGCAL) events”. 24th International Conference on Computing in High Energy and Nuclear Physics ([Paper](#) [↗](#) , [CHEP 2019](#)).

## Selected Research Projects

### ***Unreliability of Probing Classifier***

07/21 - 05/22

Advisors: [Dr. Amit Sharma](#) and [Dr. Chenhao Tan](#)

1. Theoretically proved that latent space based concept detection and removal methods like Null-Space removal (INLP) and Adversarial Removal will fail even under favourable settings.
2. We show that using these methods could be counter-productive i.e they are unable to remove the attributes entirely, and in the worst case may end up corrupting or destroying all task-relevant features.
3. Validated the theoretical observation on three real-world NLP task: Multi-NLI, Twitter sentiment detection and Twitter mention detection.
4. This work was accepted at [NeurIPS 2022](#).

### ***Disentangling Mixture of Unknown Causal Intervention***

01/20 - 04/21

Advisor: [Dr. Gaurav Sinha](#), Adobe Research, Bangalore

1. Theoretically proved that, in general, identifying individual constituents given a mixture of interventions is impossible.
2. Gave sufficient condition under which we could provably identify all the unknown intervention targets constituting the mixture.
3. Our identifiability proof gave an efficient algorithm to recover these unknown intervention targets from the exponentially large search space of possible targets.
4. This work was published at [UAI 2021](#) as an *Oral paper* with acceptance rate of 6%.

### ***Fine-Tuning Word Embedding for Domain Adaptation***

05/19 - 12/20

Advisor: [Dr. Partha Talukdar](#), Indian Institute of Science, Bangalore

1. Proposed a new regularization scheme based on drift in sense distribution of words between the source and target domain.
2. Characterized sense drift of a word by measuring JS-divergence between the sense distribution of a word between source and target domain. Sense distribution of words in both the domain were derived using existing Word Sense Disambiguation tool.
3. Our proposed regularization score preforms equivalent or better than previous work on Stack Exchange Duplicate Question Detection task, 20 Newsgroup Topic classification task and Ohsumed Medical classification task.

## Relevant Coursework

**Computer Science:** Discrete Mathematics, Data Structure and Algorithms, Machine Learning, Data Mining, Information Retrieval, Theory of Computation, Logic in Computer Science, Compilers Construction

**Mathematics:** Multivariate Calculus, Probability and Statistics, Linear Algebra, Complex Variables and Calculus, Differential Equations

**Physics:** Statistical Mechanics, Math Methods of Physics, Quantum Mechanics, Non-Linear Dynamics and Chaos, Quantum Information and Computing, Electromagnetic Theory

**Online:** [Probabilistic Graphical Models](#), [Deep Learning Specialization](#)

**Skills**

**Programming Languages:** Python, C, C++, Java, Matlab, Fortran  
**Tools and Systems:** Tensorflow/Pytorch, Linux, Git

**Academic  
Service, and  
Awards**

**Peer Review:** [CODS-COMAD'23](#)

***CausalML Reading Group***, *Co-organiser* 10/21 - Present  
Microsoft Research, Bangalore  
Co-organise weekly meetups to discuss recent trends and paper broadly in Domain Generalization and Interpretability with causal perspective.

***BITS Merit Scholarship*** 2015 - 2020  
Recipient of university's merit scholarship awarded to top 2% students based on their academic performance.

**References**

1. [Dr. Amit Sharma](#)
2. [Dr. Gaurav Sinha](#)
3. [Dr. Chenhao Tan](#)