Prashant JAYANNAVAR

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I am a recent CS PhD graduate from UIUC, advised by Prof. Julia Hockenmaier, specializing in **Natural Language Processing (NLP)**. My research centers on instruction following agents in **embodied dialogue**, with a focus on spatial intelligence and low-data regimes. Themes include **human-AI collaboration** in games (Minecraft), SLMs, synthetic data, and evaluation benchmarks.

Previously, I spent 2.5 years as a **Data Scientist** at the AI startup x.ai (acquired by Bizzabo), building a task-oriented dialogue agent for autonomous meeting scheduling.

I am actively seeking **Research Scientist** or **Applied Scientist** roles.

EDUCATION

Sept 2017 - Dec 2025 — **PhD in Computer Science**, University of Illinois at Urbana-Champaign, *Urbana, IL*
Advisor: Prof. Julia Hockenmaier (UIUC)
Committee: Prof. Dilek Hakkani-Tur (UIUC), Prof. ChengXiang Zhai (UIUC), Prof. Massimo Poesio (QMUL, UK)
Research Areas: Grounded Instruction Following, Task-Oriented Dialogue, Embodied AI, Datasets and Evaluation, Synthetic Data, Spatial Reasoning in LLMs

Jan 2015 — **MS in Computer Science (Track: Machine Learning)**, Columbia University, *New York, NY*

May 2013 — **B.Tech in Computer Science and Engineering**, National Institute of Technology Rourkela, *Rourkela, India*

RESEARCH & INDUSTRY EXPERIENCE

Dec 2025 – Sept 2017 — **Research Assistant, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, Urbana, IL**
Advisor: Prof. Julia Hockenmaier
My research addresses instruction following agents in embodied dialogue, focusing on spatial intelligence and low-data regimes. My work has developed a novel research ecosystem for this field:

Part 1: A Novel Testbed and the BAP Task

- Created the Minecraft Dialogue Corpus (MDC), one of the pioneering uses of Minecraft in this domain.
- Built and open-sourced the data collection platform for community research.
- Formulated the **Builder Action Prediction (BAP)** task for instruction following: evaluation, baselines (CNN+GRU), and data augmentation methods.

Part 2: Accelerating Progress by Creating BAP v2

- Developed an improved **evaluation benchmark**.
- Designed **novel dialogue simulators** to generate rich **synthetic embodied dialogues**.
- Designed a **Curriculum Learning** strategy to leverage this data and boost spatial reasoning in models.
- Established newer baseline architectures using **Transformers** and early LLMs (**BERT**).

Part 3: Pushing the Boundaries with Modern LLMs

- Developed the new **state-of-the-art** model, Llama-CRAFTS, achieving F1 of 53.0, +6.0 over prior SOTA (**post-training** Llama-3-8B with **SFT**/instruction tuning).
- Demonstrated that BAP v2 provides a key measure of spatial capabilities and brittleness of LLMs.

Grounded Instruction Following | Embodied AI | Spatial Reasoning | Task-Oriented Dialogue | LLMs | Synthetic Data | Evaluation Benchmarks | Data Collection | Minecraft

June 2017 – Feb 2015 — **Data Scientist, X.AI (ACQUIRED BY BIZZABO), New York, NY**
Built a production-level **NLP pipeline** for **temporal information extraction** in unstructured email text.

- Developed core techniques to **extract and normalize** temporal expressions, combining **machine learning** (CRFs, Logistic Regression) with rule-based **syntactic parsing** and a proprietary temporal markup language.
- Built a **dialog act classification** system (SVMs) to interpret user intent behind temporal expressions
- Deployed scalable **microservices** to integrate these functionalities into the main AI scheduling assistant.
- Implemented comprehensive **online and offline metrics** to monitor and benchmark model performance.
- Authored **annotation guidelines** by collaborating with diverse stakeholders (annotators, engineers, UI designers, product leaders), and supervised the annotation process.

Temporal Information Extraction | Dialogue Systems | Data Annotation | NLP Engineering | Microservices

Dec 2014 – Jun 2014

Research Assistant, Columbia University, New York, NY

Advisor: Prof. Owen Rambow

Demonstrated the **utility of NLP in digital humanities** research.

- Enhanced the SINNET system for social network extraction from literary texts, and applied it to nineteenth-century British novels to test long-standing literary theories.
- Validated system effectiveness by demonstrating a high correlation between extracted networks and human annotations, and proving its cross-genre generalization from news articles (training data) to literary texts.
- Challenged the prevailing interpretation of **literary theories** on social structure (urban vs. rural); successfully argued that prior quantitative findings support, rather than disprove, the theories' cogency.
- Generated new, stronger quantitative evidence validating the revised interpretation, **establishing a new empirical perspective** on this problem.

NLP in Digital Humanities | Social Network Analysis | Computational Literary Analysis

Additional Research Experience

May 2014 – Jan 2014

Research Student, Columbia University, New York, NY

Advisor: Prof. Daniel Hsu

- Investigated the tensor decomposition method for learning **latent variable models**, focusing on the specific case of **exchangeable single-topic models**, and proposed a simpler alternative method.
- Demonstrated that initializing the tensor power method (in the learning algorithm) with **standard basis vectors** is an ideal starting point that boosts both efficiency and accuracy compared to a random guess.

Latent Variable Models | Tensor Decomposition | Topic Modeling | Machine Learning Theory

April 2013 – Sept 2012

Research Assistant, National Institute of Technology Rourkela, Rourkela, India

Advisor: Prof. Banshidhar Majhi

- Framed the **"global" community detection** problem in social networks (partitioning the graph into disjoint communities) as an optimization problem for **Genetic Algorithms (GAs)**.
- Designed a **novel GA** featuring a new fitness function and *biased* crossover and mutation operators.
- Showed that the algorithm provides a superior balance of accuracy and efficiency compared to existing methods, and performs consistently well across both real-world and synthetic datasets.

Graph Algorithms | Community Detection | Genetic Algorithms | Optimization | Social Network Analysis

Jul 2012 – May 2012

Summer Research Fellow, Indian Institute of Science, Bangalore, India

Advisor: Prof. N. Balakrishnan

- Conducted a comprehensive comparative analysis of algorithms for the **"local" community detection** problem in social networks (finding community structure around a given seed node).
- Developed a meta-algorithmic framework that captures the algorithms' shared structure; different algorithms are shown to instantiate and customize specific components of the framework (e.g., strategies, heuristics, functions). This **novel taxonomy** thus enables systematic classification and comparison of algorithms.
- Designed a **new algorithm** derived from the insights of the taxonomy, which demonstrated superior performance by outperforming prior methods across real-world and synthetic datasets.

Graph Algorithms | Community Detection | Algorithm Design & Analysis | Social Network Analysis

Publications

J=Journal, C=Conference, W=Workshop, D=Demo, R=Report

Selected Papers

[J.1] **BAP v2: An Enhanced Task Framework for Instruction Following in Minecraft Dialogues** [pre-MIT Press publication version | code | blog]
Prashant Jayannavar, Liliang Ren, Marisa Hudspeth, Risham Sidhu, Charlotte Lambert, Ariel Cordes, Elizabeth Kaplan, Anjali Narayan-Chen, Julia Hockenmaier
*Computational Linguistics journal (*recently accepted as a long paper)* [Computational Linguistics; 2025]

[C.1] **MDC-R: The Minecraft Dialogue Corpus with Reference** [paper]
Chris Madge, Maris Camilleri, Paloma Carretero Garcia, Vanja Karan, Juexi Shao, Prashant Jayannavar, Julian Hough, Benjamin Roth, Massimo Poesio
Under review; arXiv preprint arXiv:2506.22062 [arXiv; 2025]

[R.1] **Human in the Loop Learning through Grounded Interaction in Games (Dagstuhl Perspectives Workshop 24492)** [paper | website]
Raffaella Bernardi, Julia Hockenmaier, Udo Kruschwitz, Prashant Jayannavar, Massimo Poesio
Dagstuhl Reports, Vol. 14, Issue 12, Schloss Dagstuhl – Leibniz-Zentrum für Informatik (2025) [Dagstuhl Reports 2025]

[C.2] **Learning to execute instructions in a Minecraft dialogue** [paper | video | slides | code | website]
Prashant Jayannavar, Anjali Narayan-Chen, Julia Hockenmaier
58th Annual Meeting of the Association for Computational Linguistics (Virtual) [ACL 2020]

[C.3] **Collaborative Dialogue in Minecraft** [paper | data | code (models) | code (platform) | website]
Anjali Narayan-Chen*, Prashant Jayannavar*, Julia Hockenmaier (* = Equal Contribution)
57th Annual Meeting of the Association for Computational Linguistics, Florence, Italy [ACL 2019]

Other Papers

[C.4] **Lara - Human-guided collaborative problem solver: Effective integration of learning, reasoning and communication** [paper | supplemental | blog | video]
Harsha Kokel, Mayukh Das, Rakibul Islam, Julia Bonn, Jon Cai, Soham Dan, Anjali Narayan-Chen, Prashant Jayannavar, Janardhan Rao Doppa, Julia Hockenmaier, Sriraam Natarajan, Martha Palmer, Dan Roth
Tenth Annual Conference on Advances in Cognitive Systems, Arlington, Virginia [ACS 2022]

[D.1] **Human-guided Collaborative Problem Solving: A Natural Language based Framework** [paper | blog | video]
Harsha Kokel, Mayukh Das, Rakibul Islam, Julia Bonn, Jon Cai, Soham Dan, Anjali Narayan-Chen, Prashant Jayannavar, Janardhan Rao Doppa, Julia Hockenmaier, Sriraam Natarajan, Martha Palmer, Dan Roth
Thirty-First International Conference on Automated Planning and Scheduling, Guangzhou, China [ICAPS 2021]

[W.1] **Validating Literary Theories Using Automatic Social Network Extraction** [paper]
Prashant Jayannavar, Apoorv Agarwal, Melody Ju, Owen Rambow
NAACL HLT Fourth Workshop on Computational Linguistics for Literature, Denver, Colorado [CLFL, NAACL HLT 2015]

Mentions & Media Coverage

- **Prof. Martha Palmer** (July 2023) — *My Big, Fat 50-Year Journey* (2023 ACL Lifetime Achievement Award acceptance speech). [Transcript in Computational Linguistics Journal]
- **Queen Mary University of London EECS News** (Nov 2021) — *EECS researcher wins over £1million of funding for research project* (featuring Prof. Massimo Poesio). [Article]
- **U.S. Army DEVCOM Army Research Laboratory Public Affairs** (July 2021) — *Army award-winning research to transform Soldier-robot communication*. [Article]

Technical Skills

Programming:	Python, Scala, Java, C++
ML and NLP Libraries:	PyTorch, NumPy, SciPy, scikit-learn, Stanford CoreNLP, NLTK
LLM Engineering:	Hugging Face (Transformers, Datasets, TRL, PEFT, Pipeline), Post-training (SFT), QLoRA, Distributed Training (Accelerate), BitsAndBytes
Data Analysis & Viz:	Pandas, Matplotlib, Plotly, Jupyter Widgets (ipywidgets)
Tools & Platforms:	Git, TensorBoard, Slurm, LaTeX, Unix/Linux, AWS, MongoDB, gRPC, Protobuf

Mentorship

Master's students

- **Amit Athani** (MS CS, UIUC → Palantir) — Master's Thesis (2023).
  Topic: *Introducing Builder Perspective in Minecraft Architect Utterance Generation*. [Thesis]
- **Dhruv Agarwal** (MS CS, UIUC → Amazon) — Master's Thesis (2019).
  Topic: *Multi Task Learning and Incorporating Common Sense Knowledge for Question Answering*. [Thesis]

Undergraduate students

- **Marisa Hudspeth** (BS CS, Rhodes College → PhD, UMass, Amherst) — NSF DREU Research Internship (2021).
  Project: *Synthetic Data Generation and Dialogue Simulation for Embodied AI in Minecraft*.
  Outcome: Co-author on **publication [J.1]**. [DREU Program | Paper]
- **Charlotte Lambert** (BA CS, Vassar College → PhD CS, UIUC), **Ariel Cordes** (BA CS, UMN–Morris), **Elizabeth Kaplan** (BS CS, NCSU → Amazon) — NSF DREU Research Internship (2019).
  Project: *Virtual World Context Encoding for Grounded Dialogue in Minecraft*.
  Outcome: Received the **Best Research Project Award**; Co-author on **publication [J.1]**. [DREU Program | Report | Paper | Award Details]
- **Hetvi Patel** (BS CS, UIUC), **Sana Madhavan** (BS CS+Linguistics, UIUC) — UIUC CS STARS Research Program (2024).
  Project: *Data Annotation for Fairer Evaluation for the Minecraft Builder Task*.
  Outcome: Acknowledged in publication [J.1]. [CS STARS Program]

Teaching Experience

May 2025 Sept 2021	**Teaching Assistant, University of Illinois at Urbana- Champaign, Urbana, IL** Performed TA duties including holding office hours and providing academic support for students in CS 447: Natural Language Processing (taught by Prof. Julia Hockenmaier).
May 2014 Feb 2014	**Academic Tutor, Columbia University, New York, NY** Tutored Columbia student athletes in Intro to CS and Programming in MATLAB (COMS W1005) and Calculus III (MATH V1201) as part of *Columbia's Student-Athlete Enrichment Services program*.