Prashant Dhakal

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Professional Summary

Highly motivated Ph.D. candidate in industrial engineering with 4 + years of research experience with expertise in neuromorphic computing materials for the development of AI chips, advanced manufacturing with energy efficiency and ML solutions driven by data for process improvement. Proven ability in developing novel materials for next-generation AI chip applications, pioneering ultra-low energy ceramic manufacturing techniques, and developing state-of-the-art algorithms for quality control in material processing.

Education

Ph.D., Industrial & Systems Engineering, Texas A&M University *Expected Dec 2026*
M.S., Industrial Engineering, Texas A&M University *Aug 2025*
B.S., Mechanical Engineering, University of Mississippi *May 2021*

Research Experience

Texas A&M University *Aug 2021 – Present*
Graduate Research Assistant, Faculty Advisor: Dr. Shiren Wang

Project: Bioinspired Neuromorphic Nanocomposites and Adaptive Devices for Energy-Efficient AI Hardware

- Pioneered low-cost, flexible neuromorphic materials from CNT/PDMS and ZnO/PVP nanocomposites via scalable solution processing, enabling durable, heterostimulimodulated devices for brain-inspired computing.
- Achieved ultra-low switching power consumption (1.40×10^{-10} W), 1,000-fold improvement in learning efficiency, and >1,000× power savings in artificial neural network integration, establishing highly energy-efficient synaptic primitives under tight power budgets.
- Demonstrated mechanical flexibility (5 mm bending radius), operational robustness ($>10^4$ cycles), fast learning (1 ms), and long-term memory retention (>1 day), while emulating key synaptic behaviors including LTP/LTD.
- Developed data-efficient learning methods reaching 90% accuracy on small datasets (vs. 76% for standard ANNs), providing a scalable pathway for neuromorphic hardware in data-limited AI applications.

Project: Physics-Informed Training-Free Few-Shot Learning for Cross-Material RD Prediction (LPBF)

- Designed **PIKNN**, a **training-free** 1-nearest-neighbor classifier operating in an **8-D physics-constrained** space (process parameters, energy deposition metrics, material thermal diffusivity).
- Built a cross-material protocol on **1,579 builds / 6 alloys**: trained on 4 alloys (1,244 samples), tested on unseen **Ti6Al4V** and **CuCrZr** (335); RD discretized into **4 physics-guided quality classes**.

- Outperformed a matched **Prototypical Network** baseline (same features/episodic setup, 4-way, 1–10 shots): **58.0%** on Ti6Al4V (10-shot) and **52.0%** on CuCrZr (1-shot), delivering **up to +18.3 percentage-point** gains; within **0.5 pp** on Ti6Al4V (1-shot).
- **Ablations & analyses:** energy-density-derived features were key contributors; clustering metrics, linear probes, and t-SNE indicated improved class separability versus learned embeddings.
- **Application (Manufacturing Quality Control):** Enables **rapid, training-free cross-material screening** of LPBF parameter sets to improve **first-pass yield** and reduce **scrap/porosity risk** without retraining or new data collection.

Project: Uncertainty-Aware Digital Twin Framework for Sparse-Data Optimization and Experimental Prioritization

- Developed a Bayesian digital twin pipeline for decision-making under sparse, noisy observations, combining mechanistic simulation, probabilistic calibration, and risk-aware optimization.
- Translated limited experimental measurements into case-specific posterior distributions, enabling uncertainty-aware virtual evaluation instead of deterministic point-estimate prediction.
- Built a computational screening workflow to rank candidate interventions by tail-risk performance, supporting robust prioritization when exhaustive experimentation is infeasible.
- Applied the framework to a tumor-on-chip immunotherapy scheduling problem, producing interpretable, dose-sparing recommendations that reduced total drug exposure by $\sim$31% and prioritized candidates for follow-up experimental validation rather than clinical deployment.

Project: Sustainable and Energy-Efficient Additive Manufacturing of Ceramics

- Developed a rapid additive manufacturing strategy for advanced ceramic composites, enabling energy- and resource-efficient fabrication.
- Demonstrated $>100\times$ reduction in energy consumption versus leading benchmark processes, lowering operational cost and improving process sustainability.
- Projected up to $1{,}000\times$ reduction in CO_2 emissions under comparable throughput assumptions, highlighting strong decarbonization potential.
- Fabricated robust ceramic gyroid heat exchangers designed for extreme-environment operation, advancing high-performance thermal management architectures.

Professional Experience

Managing Editor, Journal of Neuromorphic Intelligence *2024 – Present*

- Spearheaded the launch and development of a cutting-edge open-access journal at the forefront of neuromorphic computing and AI materials, expanding access and visibility for key research.
- Implemented streamlined editorial workflows and digital platform enhancements that reduced manuscript processing times by 30%, significantly improving author satisfaction and publication efficiency.

- Led strategic initiatives that grew manuscript submissions by 20%, enhancing the journal's scientific influence and attracting top-tier research contributions internationally.
- Oversaw peer-review process improvements, ensuring rigorous and timely evaluations through collaboration with expert reviewers, including support for several high-impact papers.
- Identified emerging research frontiers in neuromorphic intelligence to guide thematic special issues and calls, establishing the journal as a recognized hub for innovation.

Professional Service

- **Journal Peer Reviewer**, Nature Scientific Reports (2022)

Teaching Experience

Texas A&M University

- **Teaching Assistant:**
  - Supported instruction for: Modern Manufacturing Methods for Engineering Design (Fall 2022, Spring 2023), Facilities Design and Material Handling (Fall 2023, Spring 2024), and Engineering Economy (Summer 2024, Fall 2024, Spring 2025).
  - Led lab sessions, provided one-on-one student support, graded coursework, and contributed to course logistics and delivery.
  - Assisted faculty in curriculum enhancement and implementation of modern teaching technologies and pedagogical approaches.
  - Received positive evaluations and feedback from students and faculty for commitment to academic excellence.

Mentoring Experience

- Supervised and guided undergraduate and graduate students toward successful placements in industry and academia:
  - **Schuyler Marshall**: Industrial & Systems Engineering — Now at United Airlines
  - **Saumya Timsina**: Industrial & Systems Engineering — Now at United Airlines
  - **Chenyan Feng**: Industrial & Systems Engineering — Now pursuing master's at Texas A&M University

Technical Skills and Competencies

- **Innovative Research and Experimental Design**: Over 4 years leading independent research projects, designing novel experiments, and optimizing complex process parameters to advance materials science and manufacturing technologies.
- **Advanced Materials Characterization and Synthesis**: Expertise in polymeric formulations, nanocomposite synthesis, and nanoscale imaging techniques including SEM and TEM, with proven experience in flexible electronics and device fabrication.

- **Cutting-Edge Manufacturing Technologies**: Skilled in rapid additive manufacturing, scalable process development, and prototype innovation facilitating translation of lab-scale concepts to practical applications.
- **Data Science, Predictive Modeling, and Machine Learning**: Proficient in leveraging advanced statistical modeling, machine learning algorithms, and optimization techniques to analyze complex datasets and drive data-informed decision making using Python, MATLAB, and specialized simulation tools.
- **Grant Writing and Scientific Leadership**: Contributed in writing competitive grant proposals, published in high-impact peer-reviewed journals.
- **Technical Software and Analytical Tools**: Advanced user of Jupyter Notebook, RStudio, MATLAB, SolidWorks, Minitab, Tableau, Power BI, and Microsoft Office Suite to support comprehensive data analysis and visualization.
- **Programming and Data Management**: Proficient in Python, R, and SQL for data analysis, algorithm development, and database management supporting research innovation.
- **Core Competencies and Impact Areas**: Specialized in data analysis, machine learning, statistical learning, data visualization, signal and electrical characterization, forecasting, time series analysis, operations research, and inventory management with applications addressing critical industry challenges.

Publications

Google Scholar

Peer-Reviewed Journal Articles

1. R. Liu, J. G. Kim, **P. Dhakal**, W. Li, J. Ma, A. Hou, C. Merkel, J. Qiu, M. Zoran, S. Wang. *Neuromorphic properties of flexible carbon nanotube/polydimethylsiloxane nanocomposites. Advanced Composites and Hybrid Materials* **6**, 14 (2023). DOI: 10.1007/s42114-022-00599-9.

2. J. G. Kim, R. Liu, **P. Dhakal**, A. Hou, J. Qiu, C. Merkel, M. Zoran, S. Wang. *Heterostimuli chemo-modulation of neuromorphic nanocomposites for time-, power-, and data-efficient machine learning.* *Matter* **7**(3), 1230–1244 (2024). DOI: 10.1016/j.matt.2024.01.008.

3. R. Liu, A. Hou, **P. Dhakal**, C. Gao, J. Qiu, S. Wang. *Energy-efficient rapid additive manufacturing of complex geometry ceramics.* *Journal of Cleaner Production* **452**, 142122 (2024). DOI: 10.1016/j.jclepro.2024.142122.

4. **P. Dhakal**, X. Wu, J. G. Kim, A. Hou, S. Wang. *Bridging Synapses: A Comparative Review of Machine Learning Algorithms in Memristor Technology. Journal of Neuromorphic Intelligence*, 1, 31–37 (2024). DOI: 10.63382/jni.v1i1.7

5. X. Wu, **P. Dhakal**, J. G. Kim, A. Hou, S. Wang. *Transition Metal Dichalcogenides-Based Memristors for Neuromorphic Electronics. Journal of Neuromorphic Intelligence*, 1, 1–8 (2024). DOI: 10.63382/jni.v1i1.4

6. **P. Dhakal**,R. Liu,J. G. Kim,A. Hou, X. Wu, S. Wang. *Data-Efficient Machine Learning for in-situ Curing-aided Additive Manufacturing. Journal of Neuromorphic Intelligence*, 1, 21–30 (2024). DOI: 10.63382/jni.v1i1.6

7. A. Hou, R. Liu, J. G. Kim, **P. Dhakal**, X. Wu, J. Qiu, S. Wang.
Frontal curing of aluminosilicate–epoxy composites for extreme underwater environments.
Materials Horizons (2026). DOI: 10.1039/D5MH02462E.

Manuscripts Submitted / Under Review / In Preparation

- **P. Dhakal**, J. G. Kim, A. Hou, X. Wu, S. Wang.
Physics-Informed Training-Free Few-Shot Learning for Cross-Material Relative Density Prediction in Laser Powder Bed Fusion.
Manuscript under review (*Journal of Intelligent Manufacturing*, submitted 2025).

- **P. Dhakal**, J. Ma, J. Tao, S. Wang.
A Bayesian Digital Twin for Uncertainty-Aware Immunotherapy Scheduling on a Tumor-on-Chip Platform.
Manuscript in preparation.

- A. Hou, J. G. Kim, **P. Dhakal**, X. Wu, Y. Yang, J. Kim, K.-S. Lee, J. Qiu, S. Wang.
Energy-Efficient Strategies for Space Manufacturing and Beyond.
Manuscript under review (*MRS Communications*, submitted 2025).

- J. G. Kim, A. Hou, **P. Dhakal**, X. Wu, J. Qiu, S. Wang.
High rate manufacturing of low-power flexible memristor chips for low-latency, high security wearable LLM.
Manuscript under review (*Advanced Materials*, submitted 2025).

POSTERS & TALKS

- **Poster**, Texas Digital Twin Symposium, College Station, TX (2026).

- **Talk**, IISE Annual Conference, Arlington, TX (2026).

Professional Membership

1. **Institute of Industrial and Systems Engineers** *2022 – Present*
    - Data Analytics and Information Systems Group
    - Manufacturing & Design Group
2. **Society of Manufacturing Engineers (SME)** *2025 – Present*

Awards

- **Research Assistantship**, Texas A&M University *2021 – Present*

References

Dr. Shiren Wang
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Texas A&M University

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