Prashant Dhakal

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PROFESSIONAL SUMMARY

Industrial & Systems Engineering Ph.D. candidate focused on advanced manufacturing, AI hardware materials, machine learning, and uncertainty-aware digital twins. Four-plus years of experience building experimental and computational workflows that convert sparse process data into engineering decisions: low-power neuromorphic nanocomposites, physics-informed LPBF quality prediction, Bayesian digital twins for experimental prioritization, and low-energy ceramic additive manufacturing. Combines materials processing, device characterization, statistical modeling, and optimization for R&D, process engineering, manufacturing analytics, and digital manufacturing roles.

TECHNICAL SKILLS

Manufacturing & Process Engineering: Additive manufacturing, LPBF parameter screening, process optimization, manufacturing quality control, first-pass yield improvement, scrap/porosity risk reduction, ceramic composites, scalable solution processing, energy and CO_2 impact analysis

Data Science, ML & Digital Twins: Bayesian inference, uncertainty quantification, probabilistic calibration, risk-aware optimization, physics-informed machine learning, few-shot learning, training-free classifiers, clustering, t-SNE, predictive modeling, data visualization

AI Hardware & Advanced Materials: Neuromorphic devices, memristive/synaptic behavior, CNT/PDMS and ZnO/PVP nanocomposites, flexible electronics, low-power AI hardware, heterostimuli-modulated devices, electrical switching and reliability analysis

Experimental & Characterization Methods: Nanocomposite synthesis, polymer processing, SEM, TEM, electrical characterization, bending and cyclic reliability testing, experimental design, materials/process validation

Programming & Tools: Python, R, SQL, MATLAB, Jupyter Notebook, RStudio, Minitab, Tableau, Power BI, SolidWorks, Microsoft Office Suite

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 & ENGINEERING EXPERIENCE

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

Bioinspired Neuromorphic Nanocomposites for Energy-Efficient AI Hardware

- Pioneered low-cost, flexible CNT/PDMS and ZnO/PVP nanocomposite materials using scalable solution processing for durable neuromorphic devices.
- Achieved ultra-low switching power consumption (1.40×10^{-10} W), 1,000-fold learning-efficiency improvement, and >1,000× power savings in artificial neural network integration.
- Validated mechanical flexibility (5 mm bending radius), operational robustness ($>10^4$ cycles), fast learning (1 ms), and long-term retention (>1 day) while emulating LTP/LTD synaptic behavior.
- Developed data-efficient learning workflows reaching 90% accuracy on small datasets versus 76% for standard ANNs, supporting AI hardware applications where labeled data is limited.

Physics-Informed Few-Shot Learning for LPBF Quality Prediction

- Designed PIKNN, a training-free 1-nearest-neighbor classifier operating in an 8-D physics-constrained feature space covering process parameters, energy deposition metrics, and material thermal diffusivity.
- Built a cross-material evaluation protocol on 1,579 builds across 6 alloys, including unseen Ti6Al4V and CuCrZr test cases, to predict relative-density quality classes under limited-data conditions.
- Outperformed a matched Prototypical Network baseline by up to +18.3 percentage points in few-shot settings, enabling rapid cross-material LPBF parameter screening without retraining.

– Used ablation studies, clustering metrics, linear probes, and t-SNE to identify energy-density-derived features as key contributors to class separability and quality-control performance.

Bayesian Digital Twin for Sparse-Data Experimental Prioritization

– Developed a Bayesian digital twin pipeline combining mechanistic simulation, probabilistic calibration, and risk-aware optimization for decisions under sparse, noisy observations.

– Translated limited experimental measurements into case-specific posterior distributions, replacing deterministic point estimates with uncertainty-aware virtual evaluation.

– Built a screening workflow that ranks candidate interventions by tail-risk performance when exhaustive experimentation is infeasible.

– Applied the framework to tumor-on-chip immunotherapy scheduling, identifying interpretable dose-sparing candidates that reduced total drug exposure by approximately 31% for follow-up experimental validation.

Sustainable Additive Manufacturing of Ceramic Composites

– Developed a rapid additive manufacturing strategy for complex ceramic composites, targeting energy- and resource-efficient production.

– Demonstrated >100× reduction in energy consumption versus benchmark processes and projected up to 1,000× CO_2 reduction under comparable throughput assumptions.

– Fabricated robust ceramic gyroid heat exchangers for extreme-environment thermal management applications.

PROFESSIONAL EXPERIENCE

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

– Helped launch and operate an open-access journal focused on neuromorphic computing, AI materials, and emerging device technologies.

– Improved editorial workflows and digital platform operations, reducing manuscript processing time by approximately 30%.

– Coordinated peer review, reviewer communication, and special-issue planning while supporting a 20% increase in manuscript submissions.

LEADERSHIP, TEACHING & MENTORING

– Teaching Assistant for Modern Manufacturing Methods for Engineering Design, Facilities Design and Material Handling, and Engineering Economy at Texas A&M University.

– Mentored undergraduate and graduate students who progressed to industry roles at United Airlines and graduate study at Texas A&M University.

– Journal peer reviewer for *Scientific Reports*.

SELECTED PUBLICATIONS & MANUSCRIPTS

1. 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).

2. 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).

3. 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).

4. 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).

5. **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.

6. **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.

POSTERS & TALKS

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

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

PROFESSIONAL MEMBERSHIPS & AWARDS

– Institute of Industrial and Systems Engineers, Data Analytics and Information Systems Group, Manufacturing & Design Group *2022 – Present*

– Society of Manufacturing Engineers (SME) *2025 – Present*

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