Curriculum Vitae

Nikee Shrestha

Complex Biosystems
Center for Plant Science Innovation
Department of Agronomy & Horticulture
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[a]Clickable hyperlinks are in blue throughout

Involved in a project utilizing genomic information in neural networks to predict tissue-specific gene expression in maize.

Leading a project focused on utilizing genomic-driven and expression-driven features to estimate the effect of a gene model in maize phenotype.

Developed a pipeline to identify conserved exons between maize and sorghum, quantify population-level exon proportion, and find trans-regulatory hotspots of exon splicing in maize and sorghum.

Proficient in R, Python, and Linux programming.

Proficient in machine learning packages such as Scikit-learn, Pytorch, and Tensorflow.

Collaborating with three different research groups within and outside the University.

Familiar with software development best practices such as version control and code documentation.

Hosted a website on EC2 instance to visualize the structural variants in gene model within sorghum species using Homotools algorithm.

Github account: `https://github.com/NikeeShrestha`

Education

Ph.D., Complex Biosystems
Specialization in Integrated Plant Biology (Advisor: James C. Schnable) 2022-Present
University of Nebraska-Lincoln (UNL)

Masters, Plant Biology (Advisor: Andrew N. Doust) 2019-2022
Oklahoma State University

Bachelors of Science, Agriculture 2014-2018
Tribhuvan University

Employment

University of Nebraska-Lincoln 2022-Present
Graduate Researcher and FFAR Fellow
Projects: Genomics, comparative genomics, quantitative genetics, high throughput phenotyping

1. Understanding alternate splicing and its underlying genetic mechanism in maize and sorghum.
2. Features analysis of cloned and characterized genes shown to affect the visible phenotype in maize to train advanced models on corn genomic data.
3. Data extraction and genetic analysis of sorghum seed morphology and color traits via segmentation using a pre-trained computer vision model.

4. Using advanced AI models for predicting tissue-specific gene expression using corn genomics.
5. Satellite imagery analysis and processing to predict multistate maize hybrid yield.
6. Determining genetics of non-photochemical quenching mechanism in sorghum under nitrogen stress conditions.
7. Building genomic prediction model using environmental index and genotype information in Wisconsin diversity panel for predicting flowering time across different environments.

Oklahoma State University 2019-2022
Graduate Research Assistant
Project: Understanding the genetics basis of shattering in pearl millet

1. Creation of mapping population using wild and domesticated pearl millet accessions having different shattering phenotypes.
2. Generation of high-density linkage map using markers produced with the genotyping-by-sequencing approach.
3. Performed quantitative trait loci mapping to identify genomic region underlying the shattering in pearl millet and perform comparative genomic analysis for candidate gene identification.

Oklahoma State University 2019-2022
Graduate Teaching Assistant
Course: Introductory Plant Biology

1. Lead a group of TAs for developing the worksheets, pre-lab quizzes, answering keys, and grading rubric.
2. Work with the supervisor to design the format of the semester lab course.

Nepal Agriculture Research Center, Wheat Breeding Unit 2018-2019
Research Assistant
Project: Assist in the National Wheat Breeding Unit

1. Nursery seed grow-outs, initial evaluation trial, coordinated varietal trial, and harvest plus yield trial.
2. Wheat varieties screening against yellow and stem rust, screening of different generation lines for varietal development, and advancing through either individual plant selection or bulking method selection.
3. Crossing of wheat varieties and assisting in hybridization for targeted traits and environments.
4. Assist in the project in collaboration with Kansas State University for elite spring wheat yield trial in the field.

Honors and Awards

PSI Heuermann Graduate Recognition Award 2024
Plant Science Innovation, UNL

Third place, Poster Presentation 2024
CBIO Graduate Recruitment, UNL

Travel Award Recepient 2023
Agriculture Genome to Phenome Initiative, USDA-ISU

Third place, Poster Presentation 2023
Digital Ag and Advanced Analytics, Kansas State University

Widaman Distinguished Graduate Assistant Award 2023
University of Nebraska-Lincoln

Winner of Short Oral Presentation 2023
Nebraska Plant Science Symposium

Winner of Poster Presentation 2023
Nebraska Plant Science Symposium

Heuermann Recruitment Fellowship 2022
Department of Agronomy and Horticulture, UNL

McPherson Travel Award 2020
Oklahoma State University

Merit-based Scholarship 2014-2018
Tribhuvan University

Publications

$^{+}$authors contributed equally

Preprints

Tross MC, Duggan G, **Shrestha N**, Schnable JC Models trained to predict differential expression across plant organs identify distal and proximal regulatory regions. https://doi.org/10.1101/2024.06.04.597477

Publications

11. Mangal H, Linders K, Turkus J, **Shrestha N**, Long B, Kuang X, Cebert E, Torres-Rodriguez JV, Schnable JC (2025) Genes and pathways determining flowering time variation in temperate-adapted sorghum. The Plant Journal 122(5): e70250.

10. Mathivanan RK, Pedersen C, Turkus J, **Shrestha N**, Torres-Rodriguez JV, Mural RV, Obata T, Schnable JC (2025) Transcripts and genomic intervals associated with variation in metabolite abundance in maize leaves under field conditions. BMC genomics 26(1): 434.

9. Ali W, Grzybowski M, Torres-Rodriguez JV, Li F, **Shrestha N**, Mathivanan RK, de Bernardeaux G, Hoang K, Mural R, Roston RL, Schnable JC, Sahay S (2025) Quantitative genetics of photosynthetic trait variation in maize. Journal of Experimental Botany eraf198.

8. Davis JM, Gaillard M, Tross MC, **Shrestha N**, Ostermann I, Grove RJ, Li B, Benes B, Schnable JC (2025) 3D reconstruction enables high-throughput phenotyping and quantitative genetic analysis of phyllotaxy. Plant Phenomics 7(1), 100023.

7. **Shrestha N**$^{+}$, P Anirudha^{+}, Davis J, Ayanlade TT, Liu H, Tross MC, Mathivanan RK, Bares J, Lopez-Corona L, Turkus J, Coffey L, Jubery TZ, Ge Y, Sarkar S, Schnable JC, Ganapathysubramanian B, Schnable PS (2024) Plot-level satellite imagery can substitute for UAVs in assessing maize phenotypes across multistate field trials. Plants, People, Planet.

6. **Shrestha N**, Mangal H, Torres-Rodriguez VJ, Tross MC, Lopez-Corona L, Linders K, Sun G, Mural RV, Schnable JC (2024) Off-the-shelf image analysis models outperform human visual assessment in identifying genes controlling seed color variation in sorghum. The Plant Phenome Journal 8(1):p.e70013.

5. Ostermann I, Benes B, Gaillard M, Li B, Davis J, Grove R, **Shrestha N**, Tross MC, Schnable JC, (2024) Sorghum segmentation and leaf counting using in silico trained deep neural model. The Plant Phenome Journal 7(1):p.e70002.

4. Sahay S^{+}, **Shrestha N**$^{+}$, Dias HM, Mural RV, Grzybowski M, Schnable JC, Głowacka K (2024) Non-photochemical quenching kinetics GWAS in sorghum identifies genes that may play conserved roles in maize and Arabidopsis thaliana photoprotection. The Plant Journal 119(6):3000-3014.

3. **Shrestha N**, Hu H, Shrestha K, Doust AN (2023) Pearl millet response to drought: A review. Frontiers in Plant Science 14:1059574.

2. **Shrestha N**, Poudel A, Acharya SS, Parajuli A, Budhathoki S, Shrestha K (2018) Correlation Coefficient and Path Analysis of Advance Rice Genotypes in Central Mid-hills of Nepal. International Journal of Research in Agricultural Sciences 5(3):2348-3997.

1. Budhathoki S, Amgain LP, Subedi S, Iqbal M, **Shrestha N**, Aryal S (2018) Assessing growth, productivity and profitability of drought tolerant rice using nutrient expert—rice and other precision fertilizer management practices in Lamjung, Nepal. Acta Scientific Agriculture 2:153-158.

Peer Reviewed Conference Papers

4. **Shrestha N**, Davis J, Bares J, Ayanlade TT, Powadi A, Turkus J, Coffey L, Sarkar S, Ganapathysubramanin B, Schnbale PS, Schnable JC (2024) Out-of-year Yield Prediction From Satellite Images is More Challenging Than Out-of-location. Eighth International Workshop on Machine Learning for Cyber-Agricultural Systems *(In Review)*

3. Torress-Rodriguez JV, Perez KMC, **Shrestha N**, Turkus J, Coffey L, Schnable JC (2024) How stable are the genetic markers associated with gene expression as molecular phenotypes? Eighth International Workshop on Machine Learning for Cyber-Agricultural Systems *(In Review)*

2. Mangal H, Torress-Rodriguez JV, **Shrestha N**, Linders K, Mural RV, Schnable JC (2024) Transcriptomic Studies in Sorghum Identifies Genes and MicroRNAs Responsible for Flowering-Time and Plant-Height in Sorghum. Eighth International Workshop on Machine Learning for Cyber-Agricultural Systems *(In Review)*

1. Torress-Rodriguez JV, **Shrestha N**, Jin H, Newton L, Thompson AM, Mural RV, Schnable JC (2023) Employing environmental indices to augment cross-environment prediction accuracy in diverse maize populations. Fifth International Workshop on Machine Learning for Cyber-Agricultural Systems *(In Review)*

Presentations

13. "Mapping loci controlling sorghum seed color using computer vision models pre-trained in distantly related grain crops", Maize Genetics Meeting, Raleigh, NC, USA (lightning talk) 2024

12. "Efficient High Throughput Phenotyping of Sorghum Seeds Using a Pre-Trained Computer Vision Model", Sorghum/Millet Workshop, Plant and Animal Genome, San Diego, CA, USA (invited talk) 2024

11. "Genetic Determinants of Sorghum Phenotypic Variation Under Nitrogen Deficit Stress", Abiotic Stress Workshop, Plant and Animal Genome, San Diego, CA, USA (invited talk) 2024

10. "High throughput phenotyping using satellite images", Annual Review of Artificial Intelligence Institute for Resilient Agriculture 2023, Ames, IO, USA (oral) 2023

9. "Accurate and efficient data extraction of sorghum seeds through segmentation using computer vision model", Machine Learning for Cyber-Agricultural Systems 2023, Japan (virtual oral) 2023

8. "Accurate and efficient data extraction of sorghum seeds through segmentation using computer vision model", Nebraska Plant Science Symposium 2023, Lincoln, NE, USA (short talk) 2023

7. "Employing environmental indices to augment cross-environment prediction accuracy in diverse maize populations", Nebraska Plant Science Symposium 2023, Lincoln, NE, USA (poster) 2023
6. "Employing environmental indices to augment cross-environment prediction accuracy in diverse maize populations", Maize Genetics Conference, St. Louis, MO USA (poster) 2023
5. "Augmenting cross-environment genomic prediction by incorporating environmental indices", Plant Science Innovation Symposium, Nebraska City, NE USA (poster) 2022
4. "Understanding the genetic basis of shattering in *Cenchrus americanus*", Maize Genetics Conference, St. Louis, MO USA (poster) 2022
3. "Understanding the genetic basis of shattering in *Cenchrus americanus*", Botanical Society of America, virtual (poster) 2021
2. "The development of the abscission zone in the inflorescence of *Cenchrus* (Poaceae)", Botanical Society of America, virtual (poster) 2021
1. "Why do Plants Let Go? – From Phenotype to Genotype", Three-minute thesis (3MT) competition, Oklahoma State University (oral) 2021

Service

PlantGrad Initiative Leadership Team 2024

Machine Learning for Cyber Agricultural Systems Contest Organizer Committee 2024

Nebraska Plant Science Symposium Organizer Committee, UNL 2024

Nepalese Student Association Committee, UNL 2022-2023

Oklahoma State University Botanical Society Committee 2020-2021

Botanical Graduate Student Organization Committee 2020-2021

Nepalese Student Association, Oklahoma State University 2020-2021

Young Professionals for Agricultural Development Nepal Local Representative 2017-2018

Krishi Campus Youth Network of Amnesty International Nepal Committee 2017-2018