Post-doctoral Fellowship Opportunity
In Ecology, Remote Sensing, and Data Science
Purdue Aeroeco Lab (West Lafayette, Indiana)

We are seeking a post-doctoral fellow with expertise and experience in data science, computer science, and/or remote sensing to work on an ecological study of artificial light at night at a continental scale. Exceptional candidates with a master's degree will also be considered.

Project summary:

Artificial light at night (ALAN) is one of fastest growing pollutants (Figure 1). The rapid conversion of outdoor lighting to light emitting diodes (LEDs) is contributing to increased ALAN emissions, especially in the shorter (bluer) wavelengths (Figure 2a). Many species have higher visual sensitivity to shorter wavelengths, and blue light may attract more nocturnally migrating birds and increase collision mortalities (Figure 2b). However, our primary means to remotely sense ALAN at a national and global scale — observations based on the Suomi VIIRS Day-Night Band (VIIRS DNB) — lacks sensitivity to blue light (Figure 2a). Our project objectives are: **(1) create a multi-spectral nighttime light product** for ALAN research and monitoring in the new age of LEDs by integrating DNB observations with newer data sources; **(2) leverage this enhanced nighttime light product, in combination with continental-scale data about bird migration, to create guidelines for tuning the spectra of LED lights to minimize impacts on birds.**

Figure 1. Artificial light at night (ALAN) detected from the Suomi National Polar-orbiting Partnership satellite. The VIIRS DNB sensor detects upward radiance (light shining or reflected upwards towards space) and NASA performs a series of natural-light corrections to estimate artificial light radiance values, creating the Black Marble products. These products are used by hundreds of ecological and sociological studies, but they are insensitive to the blue light emitted by new LED technologies.

Post-doctoral fellowship objectives:

The selected fellow will focus on the first objective of the project. They will use machine learning to produce monthly and/or yearly radiance estimates for three spectral bands (red, green, and blue) for the continental United States, hereafter called the Multi-band Predicted ALAN map (MBP-ALAN). This map will provide crucial information for monitoring the growth of light pollution and understand its ecological effects in the new age of LEDs.

From a modeling standpoint, band-specific radiance measures from Glimmer Imager will serve as the response variables. The Sustainable Development Science Satellite 1 (SDGSAT-1) was launched in 2021, and its Glimmer Imager (GI) sensor collects data in three spectral bands: 424–526 nm (blue), 506–612 nm (green), and 600–894 nm (red) (Figure 2b). GI has limited spatial coverage, temporal coverage, and public data access, necessitating the use of other data sources for creating the MBP-ALAN map.

The predictors in the model will be VIIRS DNB products, hyper-spectral night-time images from newer NASA sensors, and remotely sensed measurements of human dimensions (e.g. Global Human Settlement Layer, US Census Data, National Land Cover Database, and OpenStreetMap). Predictors may also include NASA's relatively new missions, PACE, EMIT, and DESIS[1], which are collecting hyperspectral data that holds great potential to detect artificial light at night.

The selected fellow will be responsible for processing remote sensing data, using machine learning models to create the MBP-ALAN map, and evaluating uncertainty in the predictions. They will create a product that can be used by scholars and practitioners in many disciplines – including ecology, economics, and public health – and publish this product in forms that are accessible to the public and easily integrated into diverse scientific research programs. Depending on the strengths and interests of the selected fellow, some duties will be shared with post-doctoral fellow (Co-Investigator Carrie Ann Adams), and the fellow may contribute to our study of how light in each spectral band affects migratory bird attraction to ALAN.

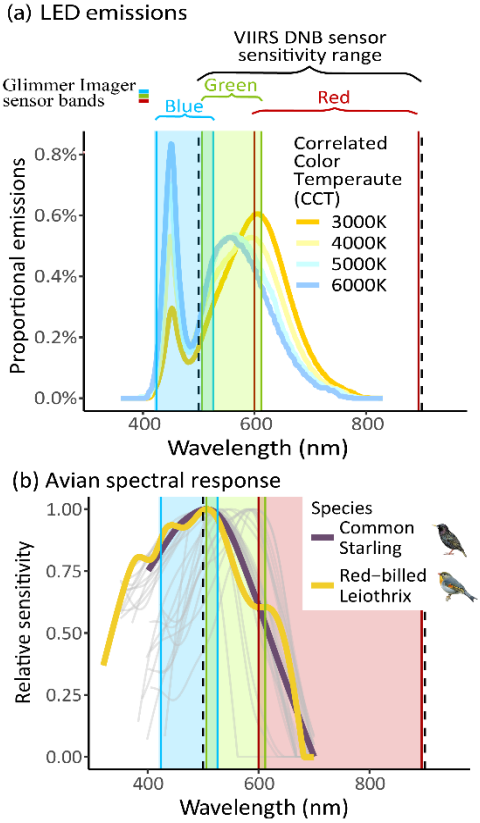

Figure 2. Spectral comparison of light emissions by LEDs, sensitivities of avian species, and sensitivities of VIIRS DNB and GI sensors (a) Spectral power distributions for LEDs of varying correlated color temperatures. Note the prominent spike in proportional emissions in the blue wavelengths. Vertical lines represent the sensitivity range of the VIIRS DNB and GI sensors (b) Visual spectral response curves for two passerine (colored lines) and 24 non-passerine (grey lines) bird species.

About the lab:

The fellow will join the Purdue AeroEco lab, led by Professor Kyle Horton, where we combine remote sensing with *in-situ* measurements of bird migration and movements to understand how climate change, urbanization, ALAN, and other anthropogenic stressors affect migratory birds. Much of our research uses Weather Surveillance Radar (the same radars that are used for weather forecasts) to study migratory birds at continental scale, in addition to our BirdScan radar, which measures local aerial activity. If interested, there will be opportunities for the fellow to participate in radar-based research.

Qualifications:

- Completion of PhD upon start date in Computer Science, Statistics, Ecology, Earth Sciences, or a related field **OR** master's degree and related experience
- Demonstrated expertise in machine learning
- Experience leading publications as a first author

[1] PACE: Plankton, Aerosol, Cloud, ocean Ecosystem; EMIT: Earth Surface Mineral Dust Source Investigation; DESIS: DLR Earth Sensing Imaging Spectrometer

- Independent, innovative problem-solver

Preferred qualities:

- Demonstrated interest in artificial light at night, ornithology, or other aspects of the project
- Experience using machine learning in combination with remote sensing products
- Willingness to relocate to West Lafayette, Indiana

Benefits:

- $60,000 – $70,000 annual salary for two years, depending on experience
- Full medical benefits
- Opportunities for professional development, including mentorship of graduate students, travel to conferences, and funding for workshops or other continuing education.

Start date:

- Flexible. We anticipate a Fall 2026 start, but can accommodate other start dates.

To apply:

- Please email application materials to Dr. Carrie Ann Adams (adam1000@purdue.edu) and Professor Kyle Horton (kghorton@purdue.edu) by **April 6th, 2025** for full consideration.

If you are seeing this advertisement after the due date but believe you are qualified for the position, please check this webpage to determine if the position is still available. If it is still posted on the webpage, please email your application materials as soon as possible. **Application materials:**

- Cover letter (2 page maximum) describing your interests, experience, and qualifications.
- Curriculum Vitae
- Please combine your cover letter and CV into a single PDF with your name as the title (FIRST_LAST.pdf)
- A product exemplifying your work. This may be a published paper, data product, website, thesis, programming package, etc.
- We will request contact information for two professional references after interviews.