

LADCO Summer 2022 Internship

The Lake Michigan Air Directors Consortium (LADCO) is hiring a summer intern to help develop and implement machine learning tools and/or statistical models to better understand ozone formation in the LADCO region.

Applications are due on March 18 at 5:00 pm Central.

Project Description

Ground-level ozone is a major component of photochemical smog. Ozone is formed through chemical reactions of other pollutants in the presence of sunlight. Breathing ozone can trigger a variety of health problems, including reducing lung function and aggravating asthma. Ozone is one of six common air pollutants identified in the Clean Air Act as “**criteria air pollutants**” and regulated by the U.S. Environmental Protection Agency (EPA) via the **National Ambient Air Quality Standards** (NAAQS) program. There are currently a number of areas in the Great Lakes states that are not meeting the ozone NAAQS. LADCO is working with its member states to reduce ozone concentrations in the region to attain these standards.

Ozone formation is impacted by a complex array of factors, including meteorology, chemistry, pollutant emissions, and the amount of daylight. It is difficult to unravel the impacts of the many different influences on ozone formation in order to understand the role of any individual factor or to track the trends in ozone concentrations in response to pollution control programs.

LADCO relies heavily on the use of photochemical grid models to study and project ozone formation. This type of model is extremely powerful but also very time- and labor-intensive, with high demands for computing power. A newer generation of statistical models and machine learning tools that have smaller computing demands are proving to be useful for investigating the drivers of ozone pollution. These models and tools develop understanding about the connections between different factors by deconvoluting overlapping trends in the environmental data instead of relying on preconceived notions about how different factors affect ozone formation. LADCO has some experience with one such tool, Classification and Regression Tree (CART), and recently investigated applications of a Generalized Additive Model (GAM) to ozone formation in the Lake Michigan region.

The 2022 LADCO summer intern will adopt and implement machine learning tools and/or statistical models to better understand ozone formation in the LADCO region. As part of this project, the intern will:

- Adapt or set up a machine learning tool in R to study the impacts of an array of factors on ozone formation. If using the GAM, the intern would start with existing R code and adapt this code as needed. For the GAM, the intern would work to reproduce an existing set of analyses for the Lake Michigan region.
- Apply the machine learning tool to understand the influences on ozone formation in another part of the LADCO region, such as Detroit or Cleveland. One central question for this analysis will be whether ozone formation in the different areas is most responsive to changes

in emissions of the ozone precursors nitrogen oxides (NO_x) or volatile organic compounds (VOCs).

The final products for the internship will be computer code and inputs needed to run the machine learning tool, along with descriptions of how to run the tool. The intern will also produce a report describing the results of application of the tool to ozone formation in a geographic area. The intern will give an oral presentation of their work to staff from LADCO and the LADCO member states.

Position Requirements

You must be a college or university student who will have completed their sophomore, junior or senior year. If you are not a U.S. citizen, you must have a valid and current student or work visa. Preference will be given to students majoring in a scientific field (including but not limited to atmospheric science, environmental science, biology, chemistry, engineering, geology, mathematics, meteorology, and physics). Students should have completed some environmental course work. Additional requirements:

- Familiarity with and ability to program in R
- Experience analyzing and interpreting complex datasets, ideally focused on environmental data
- Familiarity with machine learning or statistical models (preferred)

Details

- Term: 8 weeks in June – August 2022 (exact timing is negotiable)
- Hours: 20-30 per week
- Location: Virtual
- Stipend: \$1,500 paid in two installments
- The intern will work remotely under the supervision of the LADCO Data Scientist

Application

Applicants should submit the following materials via email to the LADCO office manager (heath@ladco.org) by March 18 at 5:00 pm Central.

- Cover letter that includes a 1-page statement describing your interest in the internship and your qualifications for the position. This statement should describe your experience analyzing environmental data or other complex datasets, applying machine learning or statistical tools (if any), and using R.
- A resume or CV that includes your full contact information, and describes your academic background, GPA, course work, academic honors or awards, and any relevant research or work experience.
- Two reference letters. Letters should address your academic abilities, accomplishments, work habits, potential as a researcher, and ability to participate in and benefit from an internship program in air quality science. Recommendations generally come from your professors or supervisors. Please include your reference letters with your application.

About LADCO:

LADCO is an air quality research and planning organization located in Chicago. We work with state, local, and tribal air agencies in the Great Lakes region to fulfill their commitments under federal clean air regulations to improve air quality in the region. The LADCO region includes Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.

LADCO provides equal employment opportunities to all employees and applicants for employment and prohibits discrimination and harassment of any type without regard to race, color, religion, age, sex, national origin, disability status, genetics, protected veteran status, sexual orientation, gender identity or expression, or any other characteristic protected by federal, state or local laws.