# Your Abstract Submission Has Been Received

Click here to print this page now.

**You have submitted the following abstract to AGU Fall Meeting 2021. Receipt of this notice does not guarantee that your submission was free of errors.**

**Chronic Respiratory Disease: Exploring the Potentials and Limitations for Risk Modeling**

**Alexander He** and Thilanka Munasinghe, Rensselaer Polytechnic Institute, Troy, NY, United States

**Abstract Text:**

According to the Global Burden of Diseases (GDB) Study for the year 2017, there were 545 million prevalent cases and 62 million incident cases of Chronic Respiratory Diseases (CRDs), which include Chronic Obstructive Pulmonary Disease (COPD) and asthma. In terms of mortality, there were 3.2 million deaths due to COPD and 495,000 deaths due to asthma. COPD was the seventh leading cause of years of life lost (YLLs). Tobacco, ambient air pollution, airborne allergens, and occupational exposures are the main risk factors associated with a lifetime increase of respiratory diseases and symptoms. Changes in temperature and humidity also exacerbate symptoms of noninfectious CRDs.

During this study, we explored the application of machine learning to forecast CRD risk and discuss its merits and limitations. We trained and tested a Random Forest regressor with CRD mortality rate as the target variable. Using recursive feature elimination with the scikit-learn Python package, we selected a subset of features from many datasets over the United States for 2000-2016. These datasets include climate variables from NOAA, fire emissions and biosphere fluxes from the Global Fire Emissions Database, and particulate matter from WashU's Atmospheric Composition Analysis Group.

We used data of county population and county borders from the U.S. Census Bureau to aggregate features by county and adjust mortality rates by population density. Due to data limitations on the country-wide level, we did not evaluate the effects of tobacco, occupational exposures, and air conditioning overuse. The final Random Forest regression model produced similar R-squared values between cross-validation and prediction on an unseen dataset (0.7526 and 0.7528, respectively). This implies that our model generalizes well to some degree on unseen data. The selected features comprise location and temporal encoders, population density, and net primary production. This study reveals it is feasible to model CRD risk on a country-wide scale, but highlights setbacks such as the primarily noninfectious nature of CRDs, phenomena only identifiable on finer spatiotemporal scales, and data limitations. We intend to investigate methods to improve our model, such as using datasets from alternative sources and exploring hyperparameter optimization techniques.

**Session Selection:**
IN020. Data and Information Services for Interdisciplinary Research and Applications in Earth Science

**Submitter's E-mail Address:**
hea2@rpi.edu

**Abstract Title:**
Chronic Respiratory Disease: Exploring the Potentials and Limitations for Risk Modeling

**Requested Presentation Type:**
Assigned by Program Committee (oral, eLightning or poster discussion session)

**Previously Published?:**
No

**Abstract Payment:**
Paid (agu-fm21-990614-2339-2624-7806-7626)

*I do not want to be involved in the OSPA program as a judge (students will be able to opt-into the OSPA program in October).*

First Presenting Author
***Presenting Author***

Alexander He
**Primary Email:** hea2@rpi.edu

**Affiliation(s):**

Rensselaer Polytechnic Institute
Troy NY (United States)

Second Author

Thilanka Munasinghe
**Primary Email:** munast@rpi.edu

**Affiliation(s):**

Rensselaer Polytechnic Institute
Troy NY 12180 (United States)

**If necessary, you can make changes to your abstract submission**

To access your submission in the future, point your browser to: User Portal
Your Abstract ID# is: 990614.
Any changes that you make will be reflected instantly in what is seen by the reviewers.
After the abstract proposal is submitted, you are not required to go through all submission steps to make edits. For example, click the "Authors" step in the Abstract Submission Control Panel to edit the Authors and then click save or submit.
When you have completed your submission, you may close this browser window or submit another abstract proposal: Call for Abstracts.

## Tell us what you think of the abstract submission process