

Chemical and biomolecular engineering

with Dr Yamil Colón

Talking points

Knowledge & Comprehension

1. What is a common example of adsorption?
2. What is carbon capture? How can adsorption help with carbon capture methods?
3. What is the difference between absorption and adsorption?
4. Why do scientists need to discover new adsorbent materials?
5. What type of adsorption model are Yamil and his team hoping to create?

Application

6. How could new adsorbent materials be applied to address the issue of water scarcity?

Analysis

7. Why is Yamil's research team looking at new porous materials for adsorption? What is it about porous materials that make them well-suited to this?
8. What can molecular models teach scientists?
9. Why did the research team combine active learning algorithms with molecular simulations? What benefit did this have?

Evaluation

10. "Look to enrich your learning with classes outside of your major; these will help you appreciate different perspectives and points of view." How important do you think Yamil's advice is, and why? Why do you think being able to see different points of view is a useful skill for a science career?

Creativity

11. An eNose device analyses the molecules in a person's exhaled breath to see if it contains compounds connected to lung disease. What other potential biological devices can you come up with that might be able to check if someone has a specific disease?

Activity

As well as his scientific research, Yamil's project includes outreach and education components that share his findings and encourage others to become interested in his field of work.

These components include improving course design so that more people understand what machine learning is; hosting middle school STEM teachers on campus to create course materials on probability and statistics; and translating middle school course materials into Spanish to distribute throughout the local community and in Puerto Rico.

Complete a similar outreach or education focused task. For instance, if you know another language, your task could involve translating the main points of Yamil's article into that language, so that other people can benefit from his work too. Afterwards, test out your translation and teaching skills on other speakers, whether they are classmates, friends or family.

If you do not know another language, you could 'translate' his research into another format, such as a cartoon strip or infographic.

Extend your 'outreach' efforts and research another subject that people typically do not know much about – such as machine learning or active learning. Design an outline of your own teaching course that would teach this subject. Feel free to choose something you are an expert in! Afterwards, share your course design with others.

Once you have completed your task and heard from other members of your class, reflect on how important outreach and education is. What did you learn from both teaching and being taught?

More resources

- Yamil recommends the international adsorption society (IAS), which has some interesting information on adsorption:
www.int-ads-soc.org/what-is-adsorption
- Learn about Yamil winning an NSF CAREER award here:
engineering.nd.edu/news/yamil-colon-receives-nsf-career-award-to-advance-understanding-of-gas-adsorption-in-porous-materials
- Read about another project Yamil is involved in:
fightingfor.nd.edu/2022/fighting-for-renewable-energy
- Yamil is a mentor for Building Bridges, a mentorship programme that matches first-year students with faculty mentors from different departments they wish to explore:
mmps.nd.edu/get-involved/educational-outreach