THE INFORMATION AND NETWORK SCIENCE LAB WITH PROFESSOR JUSTIN COON

TALKING POINTS

KNOWLEDGE

1. What is molecular communication?
2. What is a distributed network?

COMPREHENSION

3. What is data compression and why is it useful?
4. What is information theory and how is it used?

APPLICATION

5. How do you think Justin's team puts a 'value' on different information? How can they ensure their priorities align with data users?
6. What information do you think Tanmayee draws on to ensure her framework stays 'one step ahead' of security threats?

ANALYSIS

7. The article mentions that communication via electric circuits or radio waves can be impractical or unsafe in nanotechnology. Thinking about proposed uses for nanotechnology, why do you think this is?
8. What do you think are potential drawbacks of data compression?

SYNTHESIS

9. Researchers are investigating the use of molecules to transmit information from one point to another. Can you think of other instances where researchers are drawing on lessons from the natural world?

EVALUATION

10. As our lives become increasingly dependent on data, the level of seriousness increases as this data becomes compromised. With this in mind, and after rereading the article, do you think the Internet of Things is a good idea?

MORE RESOURCES

- Head to Justin's Futurum webpage for an animation about his research: link TBC
- This article provides a 'gentle introduction' to information theory and how it relates to compression and classification: **machinelearningmastery.com/what-is-information-entropy**
- This video introduces the Internet of Things and explains how it works: **www.youtube.com/watch?v=LlhmzVL5bm8**
- This article explains how nanotechnology uses molecular communication: **hackernoon.com/an-intro-to-nanotechnology-what-is-molecular-communication-kx9c3398**

ACTIVITIES YOU CAN DO AT HOME OR IN THE CLASSROOM

1. Think of as many different types of communication systems as you can, and how they incorporate an emitter (something that makes a signal), a medium (how the signal travels), and a receptor (something that receives a signal). Here are a few prompts:

   - Electric current
   - Sound
   - Light
   - Radio waves
   - Molecular signalling

   Then consider the following for each system. If you have the right materials, try to build some of the communications systems to help visualise the answers (see activity 2, below).

   - What tools do you need for such a system?
   - What are the benefits of this system?
   - What are the drawbacks of this system?
   - How could this system be more sophisticated?
   - How does the information change as it's being transmitted?
   - What are the applications of this system in the real world?

   Use the internet to supplement your answers. Compare with a classmate. Did they think of anything that you didn't?

   Finally, think about the possibilities for communications systems in the future, such as molecular communications. What advantages will these potentially bring?

2. You can build a very simple communication system by shining a torch at a video camera/phone, like Morse code, and recording the transmission. Consider how information is encoded in the intensity of the light, how the medium affects the light, and what processes the receptor must undertake to recover the message.