EXperimental Learning

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Big Data and Social Analytics certificate course

MODULE 4 UNIT 1
Introduction to peer networks

MIT BDA Module 4 Unit 1 Video Resource

Learning outcomes:

LO1: Identify the basic concepts of peer networks, the temporal dynamics of social networks, and network theory.

LO2: Demonstrate the ability to visually represent peer networks.

Title: Introduction to peer networks

In Video 1, Arek Stopczynski explains that people live in networks, and that these networks have different dynamics and structures. Of particular interest are the positions individuals occupy within their networks, and the implications they have.

Video 1: Arek Stopczynski – An overview of peer networks.
(To download the video, click here.)

As you heard in the above video, based on individual roles within a network, and using the strength of the strongest ties theory, it is possible to determine the correct people to vaccinate in order to prevent or contain an outbreak of disease.

For a more in-depth understanding of these concepts, beyond what you are expected to know for this course, read the following articles:

- The Strength of the Strongest Ties in Collaborative Problem Solving
- Social Network Sensors for Early Detection of Contagious Outbreaks
- Vaccination and Complex Social Dynamics (only pages 1-20 are relevant)

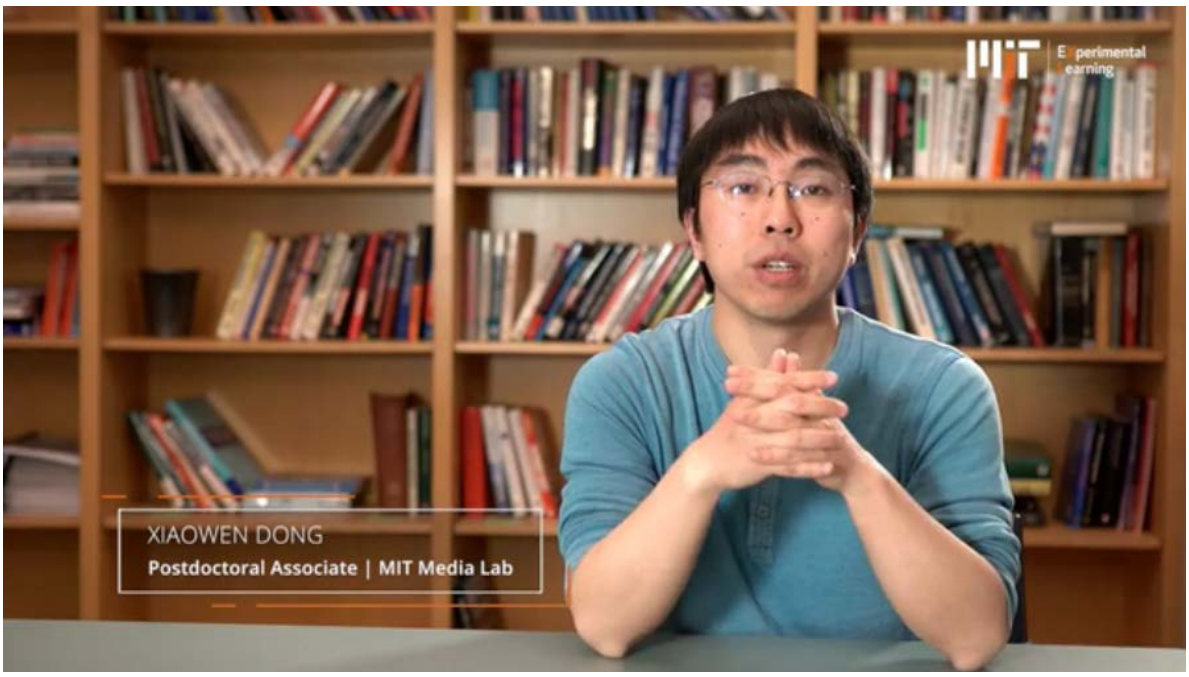
Note:

All of the articles included in this video resource have been provided for enrichment purposes only, and will not form part of the assessments for this module

In Video 2, below, Xiaowen Dong provides an introduction to network theory. He also discusses empirical networks and the representation of networks.

Video 2: Xiaowen Dong – Introduction to network theory.
(To download the video, click here.)

In video 3, Xiaowen Dong introduces a number of basic concepts of networks, including undirected networks, weighted networks, the degree of vertex, path and shortest path, and components.



Video 3: Xiaowen Dong – Basic concepts of networks.
(To download the video, click here.)

For a more in-depth explanation of the concepts covered in Video 3, beyond what you are expected to know for this course, read Sections 2.1 and 2.2 (Pages 23-32) of the book titled *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*. In addition to this, in an article titled "The structure and function of complex networks", M. E. J. Newman discusses the concepts of graphs and connectivity in depth, which has also been provided for further enrichment.

In the interest of keeping this additional content as relevant as possible, please note that it is not necessary for you to read Sections III and VI of "The structure and function of complex networks" at this stage, as these will be included as additional readings later in this unit.

You are almost ready to apply your knowledge

In order to complete the activities in the Apply unit you will need to have watched Videos 1, 2, and 3 in this resource, as well as the videos in the next resource. You can access this video resource by navigating back to your module learning path, or click to access it directly from here:

4.2 Video: The structure of networks

Reference list

Video 1

Christakis, Nicholas A., and James H. Fowler. 2010. “Social Network Sensors for Early Detection of Contagious Outbreaks.” PLoS ONE 5. doi: 10.1371/journal.pone.0012948.

de Montjoye, Yves-Alexandre, Arkadiusz Stopczynski, Erez Shmueli, Alex Pentland, and Sune Lehmann. 2014. "The strength of the strongest ties in collaborative problem solving." Scientific reports 4.

Mones, Enys, Arkadiusz Stopczynski, Alex Pentland, Nathaniel Hupert, and Sune Lehmann. 2016. "Vaccination and Complex Social Dynamics." arXiv eprint arXiv:1603.00910.

Video 2

Dong, Xiaowen. 2016. “Networks: Concepts and applications.” Content slides. Massachusetts Institute of Technology (MIT).

This work, "The Königsberg Bridge problem", is a derivative of "Königsberg bridges" by Wikimedia user Bogdan Giuşcă, “7 bridges” by Wikimedia user Chris-martin, and “Königsberg graph” by Wikimedia user Riojajar~commoncswiki, used under CC BY-SA 3.0. "The Königsberg Bridge problem" is licensed under CC BY-SA 3.0 by GetSmarter.

Video 3

Dong, Xiaowen. 2016. “Networks: Concepts and applications.” Content slides. Massachusetts Institute of Technology (MIT).