

About the logo

Cognitive Neuroscience of Decision Making

This course spans the range of cognitive neuroscience topics, with a focus on how each cognitive process relates to decision making. Every week the class produces a collaborative project investigating a different topic.

This site provides online guides for researching and learning about decision making, based on the course projects.

See below for details on the kinds of resources contained in the guides.

Topics

Topic	
Taste (gustation)	Sensory processes influence one of the most basic kinds of choices
Value	How do we automatically judge the value of different choices?
Dopamine	This neurotransmitter signals reward prediction error, which influences how likely we are to make a choice again in the future.
Emotion	How do our emotions influence decision making?
Movement	When and how we move our bodies affects the options available to us, but we seldom make these decisions consciously.
Semantic memory	When we “go with our gut” we often base choices on associations between concepts that we have learned implicitly over time.
Episodic memory	A fundamental decision we have to make in our daily lives is whether our memories really correspond to events we experienced.
Executive function	Cognitive abilities and limitations that affect decision making.
Reasoning	Strategic thinking about problems and decisions.
Consciousness	Is consciousness necessary for decision making?
Empathy	Understanding other people's minds and perspectives influences our decisions.
Social cognition	Social decision making.

Topic	
Taste (culture)	Many of our most confident decisions are guided by preferences we learn implicitly from our cultural experience. We know what we like.

Search the guides

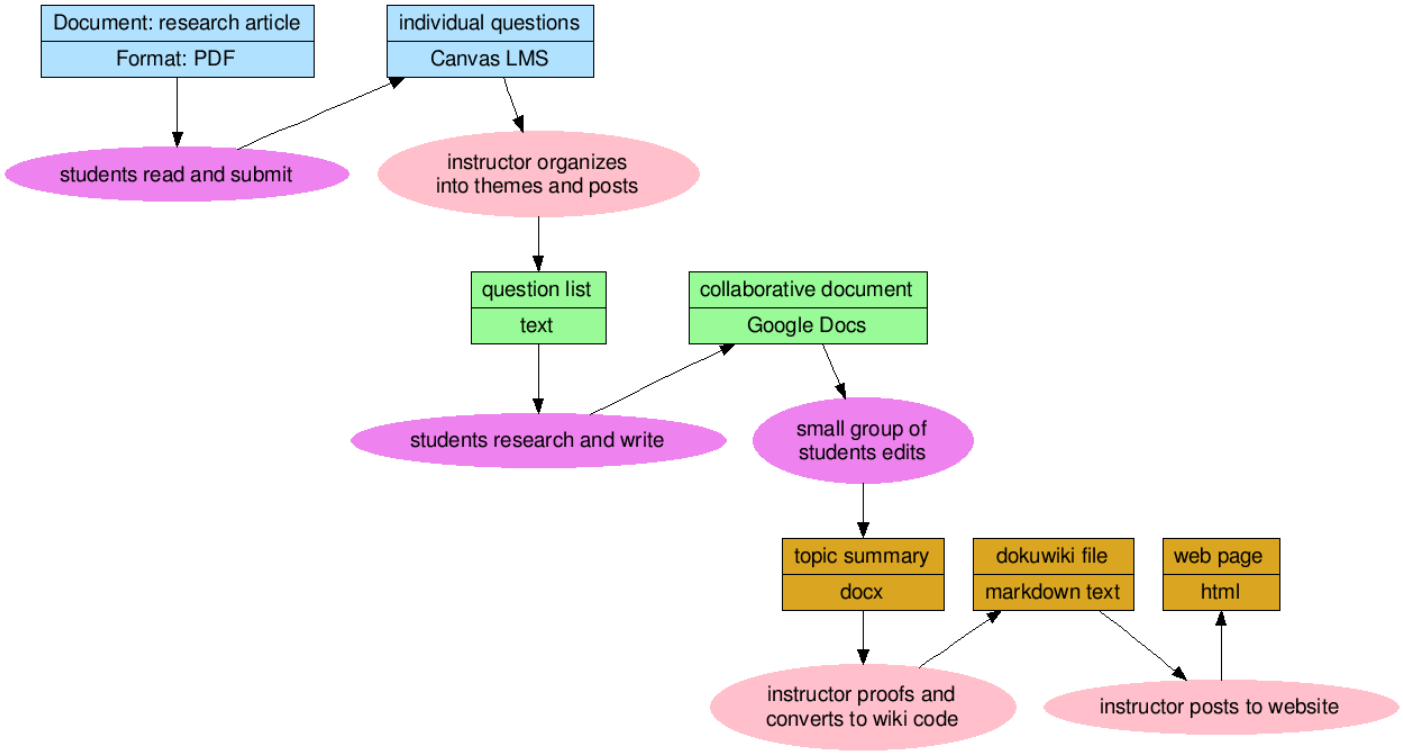
What would you like to understand about decision making? Try terms in quotes (“`ventral striatum`”) or longer phrases without quotes (`How does emotion influence decision making`).

Search

Download as book

Click this link to download all of the guides as a single PDF book with a detailed table of contents. (The document will be over 200 pages, so the download may take a moment.)

How the guides are produced



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Contents of the guides

A reference to an article

A good first step for learning about a new topic is to identify a single influential article from that field and read it. This can be challenging because such articles often assume that the reader will be familiar with the topic already, and you'll have a lot of questions. But when you finish, you'll be equipped with an understanding of the key terms, concepts, and unsolved problems for the field, and can then choose where to focus next.

Most of the readings are review articles from journals like *Annual Review of Psychology*. Several of the readings are chapters from the textbook *Neuroeconomics* (Glimcher and Fehr, Eds.). Three of the readings are primary research articles.

Cognitive process neuroimaging analysis

The class uses Neurosynth to explore neuroimaging results related to the topics. Neurosynth provides brain images of automated meta-analyses of terms from the neuroimaging literature. It makes an excellent starting point for understanding a new topic by learning which brain networks are likely to be involved.

Students learn to view and analyze the meta-analysis maps using the freely available Mango neuroimaging software. Each guide includes images of brain maps from a term in the Neurosynth database that relates to the topic.

Learning which brain regions are associated with a cognitive process is not informative on its own. Students pick one associated brain region from the topic's Neurosynth map and produce a list of other terms that are associated with that region as well. This provides a jumping-off point for making connections among different cognitive processes.

The Neurosynth term chosen for the topic is also used to generate lists of the top 5 research articles for that term. These are not necessarily the most cited articles for the term. One list contains the first 5 articles returned by the PubMed database, according to its "Best match" feature. The other list contains the 5 articles most highly associated with that term from the Neurosynth database.

Questions and answers based on the article

The guides include discussions of the article for that topic, in the form of questions posed by the students along with their researched answers. These Q&A sections can serve as helpful reading guides to the articles.

The class' goal is to read these advanced articles from the point of view of a scientist learning about a completely unfamiliar topic. That includes looking up the definitions of unfamiliar jargon and concepts. However, the most important activity is making connections between the new topic and research that the scientist already knows.

In class, the instructor posts a list of the students' questions to a Google Docs document, and students work together researching and writing answers. About 25 students write at the same time, and edit each other's work. A very important part of this is to collect links and bibliographic references to the research sources.

An extensive bilbiography

The bibliographies supplement the references given in the topic's article. The bibliographies contain mostly primary research articles, but also include websites and other resources.

Bibliographic information is collected and reproduced using Zotero.

FAQ

Q: What are all the funny names (like “SocialAnvil”) that pepper the question and answer sections?

To promote expression and protect identity, students identify themselves with randomly-generated user names when editing the collaborative documents in class.

Q: How authoritative are the guides?

The content of the guides was written by diligent students who consulted primary (research articles) and secondary (review articles, websites) sources. The students' peers and the course instructor reviewed much, but not all, of the material. It is certainly possible that the guides contain factual errors.

The goal of this project is for the authority of the material to rely entirely on the bibliographic references. However, statements followed by a reference or footnote are not automatically correct.[1)] The references themselves can always be irrelevant or inaccurate. Hopefully the guides will give readers the references necessary for tracking down authoritative answers.

Q: Is this a work in progress?

Yes, it is, by design. The course was first held in Spring 2019. Every time the course is held again, more questions will be asked and answered, and more material will be integrated into the guides.

1)

Howard, Howard & Fine (1934)

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