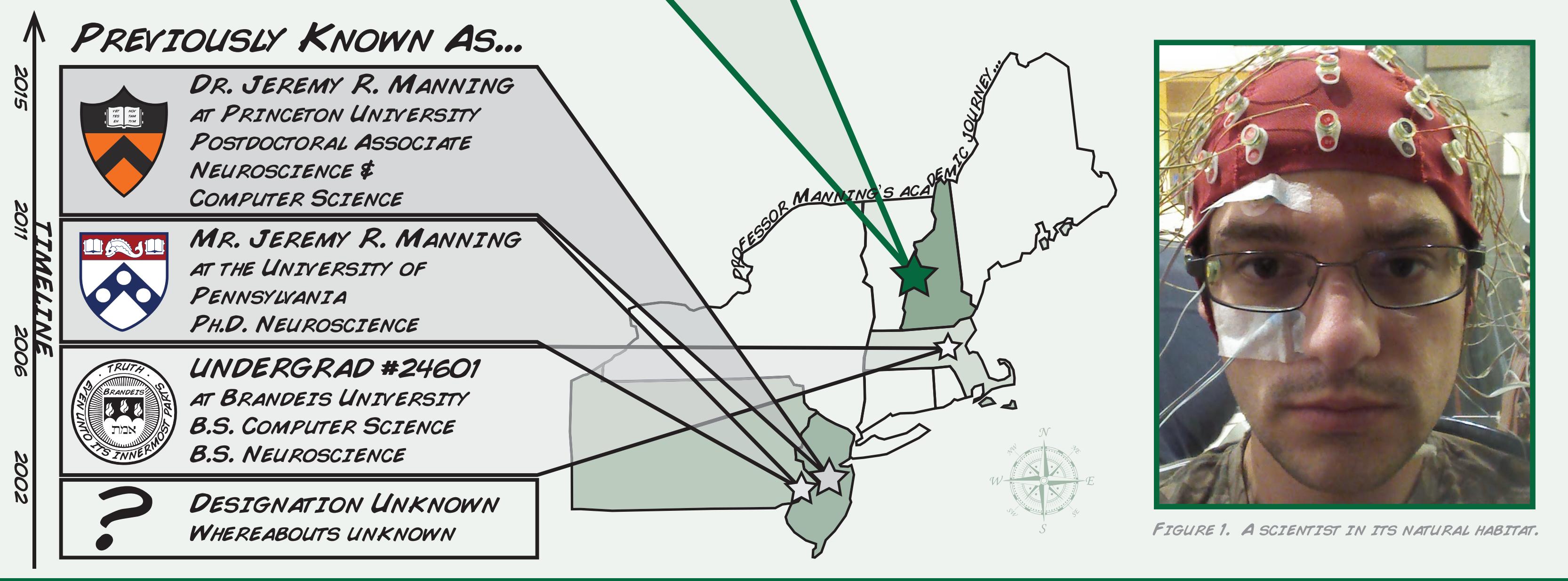




PROFESSOR JEREMY R. MANNING

AT DARTMOUTH COLLEGE SINCE SUMMER 2015



TEACHING

PROFESSOR MANNING WILL BE TEACHING A 50S LEVEL COURSE (HUMAN MEMORY) IN THE WINTER AND PSYC11 (LABORATORY IN PSYCHOLOGICAL SCIENCE) IN THE SPRING.



PSYC50: HUMAN MEMORY. KNOWING HOW OUR BRAINS ORGANIZE AND SPONTANEOUSLY RETRIEVE MEMORIES IS AT THE HEART OF UNDERSTANDING THE BASIS OF THE ONGOING INTERNAL DIALOG OF OUR CONSCIOUS THOUGHTS. PUT SIMPLY, OUR MEMORIES MAKE US WHO WE ARE. THE FIELD OF HUMAN MEMORY ALSO HAS A PRACTICAL SIDE. FOR EXAMPLE, SHOULD YOU CRAM FOR YOUR EXAM, OR IS IT BETTER TO GET A GOOD NIGHT'S SLEEP INSTEAD? OR, WHAT'S THE FASTEST WAY TO MEMORIZE A LARGE AMOUNT OF NEW INFORMATION OR LEARN TO PLAY A NEW SONG ON THE PIANO? IN THIS COURSE, WE WILL SYSTEMATICALLY EXPLORE THE FIELD OF MODERN HUMAN MEMORY BY EXAMINING THE CLASSIC AND CUTTING-EDGE EXPERIMENTAL PARADIGMS AND FORMAL (MATHEMATICAL) MODELS THAT FORM THE FOUNDATION OF OUR CURRENT UNDERSTANDING OF HUMAN MEMORY. THE MATHEMATICAL CONCEPTS REQUIRED FOR THIS COURSE WILL BE COVERED IN CLASS.

PSYC11: LABORATORY IN PSYCHOLOGICAL SCIENCE. HAVE YOU EVER WONDERED WHY PEOPLE ACT A PARTICULAR WAY, OR WHY YOU THINK LIKE YOU DO? IF SO, YOU'RE WELL

ON YOUR WAY TO BECOMING A REAL LIVE PSYCHOLOGICAL SCIENTIST! THIS COURSE WILL TRAIN YOU IN THE WAYS OF THE MODERN RESEARCH PSYCHOLOGIST. WE WILL DEVELOP TOOLS AND THE RESEARCH BACKGROUND NEEDED TO CONDUCT SCIENTIFICALLY SOUND AND ETHICAL RESEARCH. STUDENTS WILL DESIGN AND CARRY OUT ORIGINAL RESEARCH IN SMALL TEAMS THROUGHOUT THE TERM.

FIGURE 2. COURSE DESCRIPTIONS.

RESEARCH

IN THE CONTEXTUAL DYNAMICS LABORATORY (CDL), WE ARE INTERESTED IN HOW OUR BRAINS ACQUIRE, PROCESS, STORE, AND RETRIEVE INFORMATION ABOUT OUR ENVIRONMENT AS A FUNCTION OF THE CURRENT CONTEXT OR SITUATION. WE USE FANCY COMPUTATIONAL MODELS AND POWERFUL NEUROIMAGING TECHNIQUES TO GAIN INSIGHTS INTO THESE PROCESSES. SOME EXAMPLES OF OUR ONGOING RESEARCH PROJECTS ARE HIGHLIGHTED BELOW.

TRACKING THOUGHTS

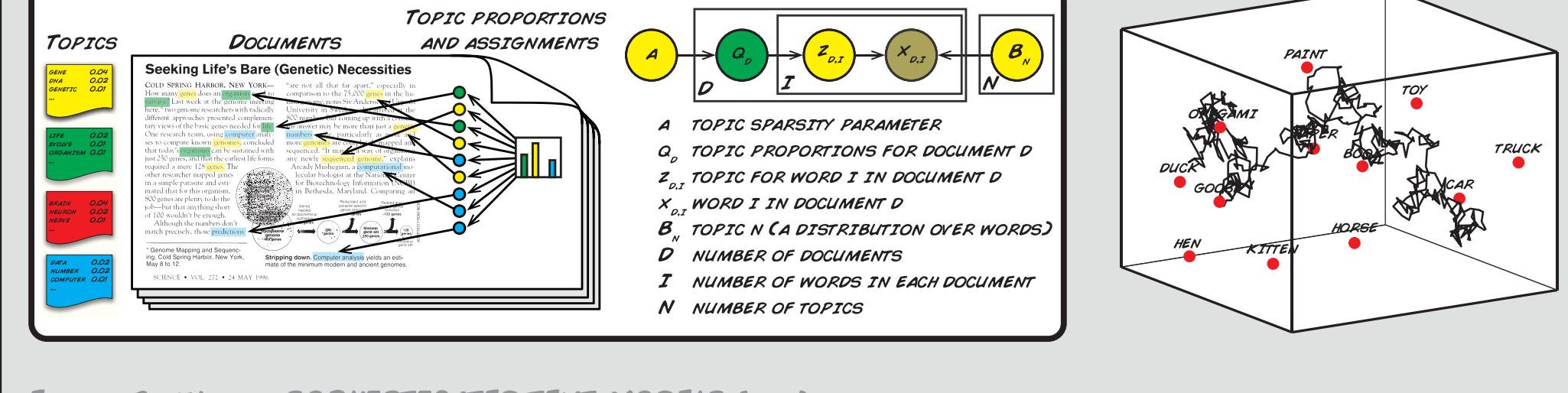


FIGURE 3. WE USE SOPHISTICATED TEXT MODELS (LEFT) TO QUANTIFY THE MEANINGS OF WORDS AND HOW DIFFERENT WORDS ARE RELATED. WE USE THESE MODELS TO EXPLORE AND INTERPRET PEOPLE'S BRAIN DATA AND BEHAVIORS DURING PSYCHOLOGICAL EXPERIMENTS. WE USE THIS APPROACH TO TRACK PEOPLE'S THOUGHTS (RIGHT) DURING THE EXPERIMENTS TO GAIN INSIGHTS INTO THE UNDERLYING COGNITIVE PROCESSES.

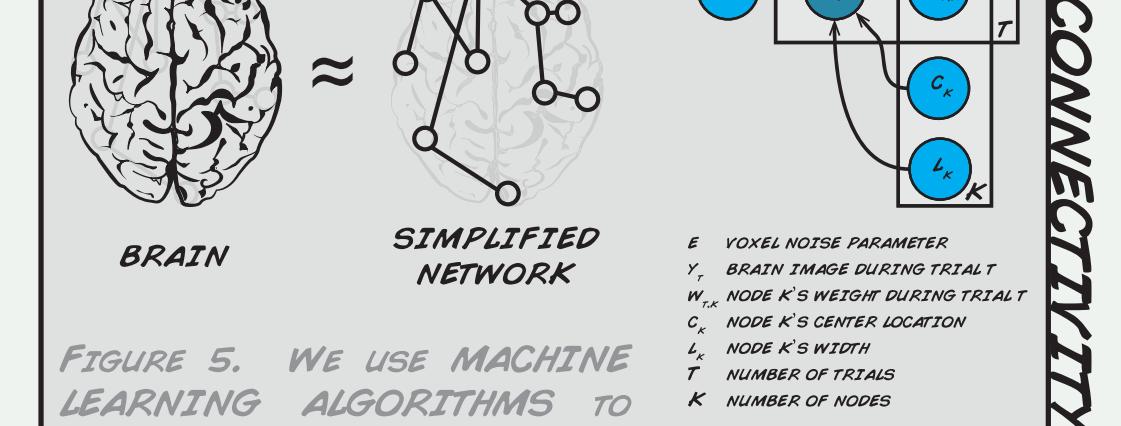


FIGURE 5. WE USE MACHINE LEARNING ALGORITHMS TO EXPLORE AND UNDERSTAND BRAIN NETWORKS (HOW DIFFERENT BRAIN STRUCTURES INTERACT AS PEOPLE ARE DOING INTERESTING STUFF). A. OUR "TRICK" IS TO REPRESENT BRAIN NETWORKS AS COLLECTIONS OF CONNECTED NODES. B. THIS ENTAILS BUILDING MODELS OF HOW CONNECTIVITY PATTERNS ARE REFLECTED IN PEOPLE'S MEASURED BRAIN PATTERNS AND USING BAYESIAN INFERENCE TO FIT THE MODEL PARAMETERS TO THE DATA.

PUTTING OUR MEMORIES INTO CONTEXT

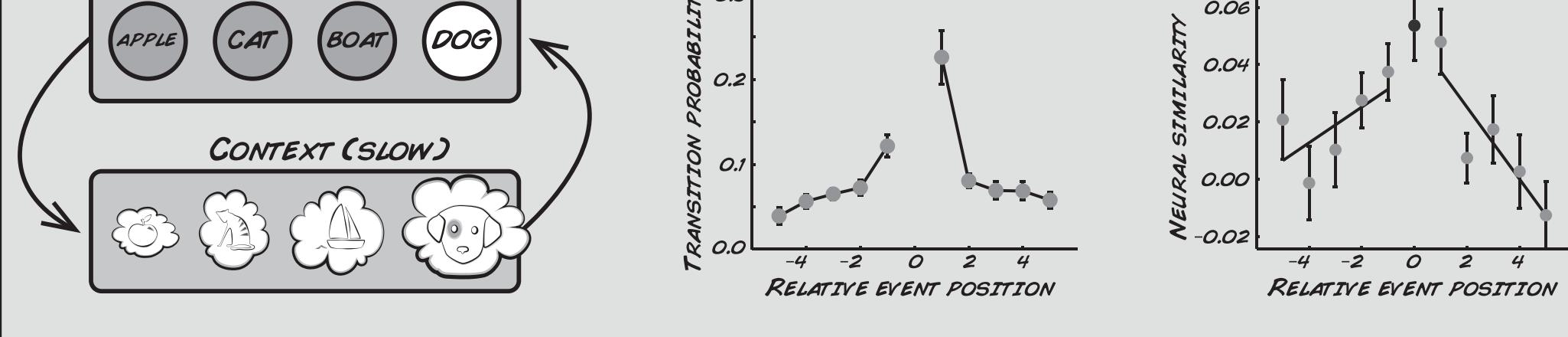


FIGURE 4. MODERN THEORIES OF EPISODIC MEMORY (MEMORY FOR AUTOBIOGRAPHICAL EVENTS) POSIT THAT OUR MEMORIES ARE REPRESENTED AT MULTIPLE TIME SCALES. ACCORDING TO THESE MODELS, OUR THOUGHTS NOW REFLECT A MIXTURE OF THE EVENT(S) WE ARE EXPERIENCING NOW AND THE EVENT(S) WE EXPERIENCED IN THE RECENT PAST. (THIS MEANS OUR THOUGHTS ABOUT PREVIOUSLY EXPERIENCED EVENTS FADE AWAY GRADUALLY.) THESE THOUGHTS ABOUT THE PAST HELP TO CONTEXTUALIZE OUR EXPERIENCES IN THE PRESENT AND PLAY A KEY ROLE IN INDEXING OUR MEMORIES. A. SCHEMATIC OF A SIMPLE MULTIPLE TIME SCALE MODEL CONTAINING A FAST AND SLOW REPRESENTATION OF WORDS ON A STUDIED LIST. B. GIVEN THAT WE HAVE JUST REMEMBERED AN EVENT, WE ARE LIKELY TO NEXT REMEMBER ANOTHER EVENT THAT OCCURRED NEARBY IN TIME. C. OUR BRAIN PATTERNS MEASURED JUST BEFORE WE RECALL A PAST EVENT ALSO CONTAIN TRACES OF BRAIN PATTERNS ASSOCIATED WITH OTHER EXPERIENCES THAT OCCURRED NEARBY IN TIME.

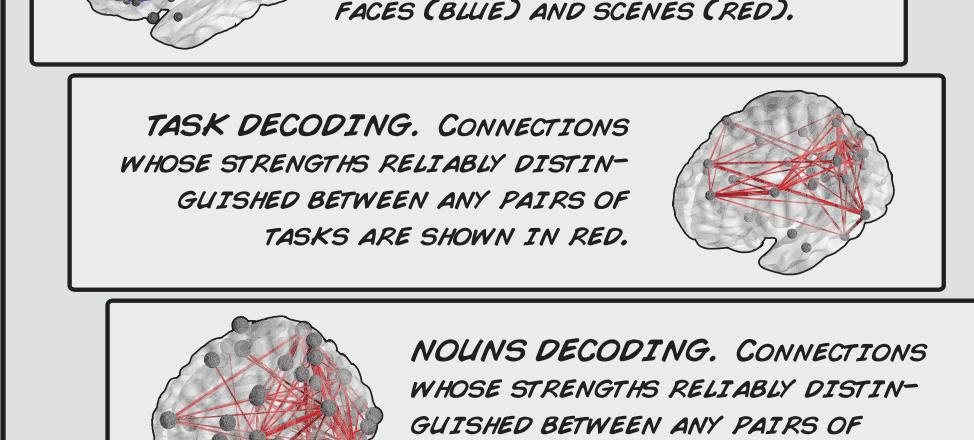


FIGURE 6. EXAMPLES OF SOME INTERESTING CONNECTIVITY PATTERNS WE'VE FOUND USING THIS MODEL-BASED APPROACH TO BRAIN CONNECTIVITY. AFTER FITTING OUR MODEL TO EACH DATASET, WE LOOK FOR NODE-TO-NODE CONNECTIONS THAT RELIABLY CHANGE THEIR CONNECTIVITY PATTERNS AS A FUNCTION OF EXPERIMENTAL CONDITION OR (EXPECTED) COGNITIVE STATE.

HOW CAN YOU GET INVOLVED?!?

OUR LAB IS ALWAYS ON THE LOOKOUT FOR FRESH NEW BRAINS. ARE YOU A PSYCHOLOGY NUT WHO WANTS TO HELP CRACK THE MYSTERIES OF THE MIND? ARE YOU A COMPUTER NERD WHO WANTS TO CODE UP AWESOME EXPERIMENTS OR USE CUTTING-EDGE MACHINE LEARNING ALGORITHMS TO UNDERSTAND COGNITION? OR DO YOU WANT TO PARTICIPATE IN ONE OF THE LAB'S ONGOING STUDIES? LET'S TALK!

