CS CM 182 Homework 1

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I completed this written part of the homework, lab report, or exam entirely on my own.

The definition of hypothesizing is the active process of formalizing scientific notions. The two main stages of hypothesizing is modeling and formalizing the words. Modeling is referring to the process of beginning with verbal descriptions for expressing, studying and researching relevant ideas. Formalizing is referring to the conversion of words into different types of explicit model diagrams, equations or computer simulations. There are three purposes of the usage of explicit models. The first purpose is to codify and help clarify the nature of biosystem phenomena under study. The second purpose is to help refine conceptual understanding of the form and function. The third purpose is to help precisely frame questions and explore new ideas in researching them. The two main purposes of biological models are mirroring reality and becoming abstract tools for studying and analyzing the real biosystem in order to reveal the principles. Graphs are being defined as plots for showing the relationship between two variable quantities with each plotted along one of the two axes. System model is a model of a collection of objects, or components parts, interconnected in a purposeful way. It is also defined as a hypothesis explicitly formalized from biophysical and biochemical principles into a hypothetical construct, organized as an explicit structural biosystem model. System model is being constructed with components that are organized from mechanistics, morphological, or topological information of a qualitative nature. Biomolecular transformations include transduction, transcription and translation in cell biology and mass action based interactions in biochemistry. Animal system refers to a model system in reference to studies in an animal other than human because it is not feasible to conduct experiments directly on humans. Data refers to factual information obtained from experiment in the form of either qualitative data or quantitative numbers. A qualitative model based on qualitative data while a quantitative model based on numerical data such as equations and graphs. State variables are biosystem objects and refer to the abundance or concentration of a biomolecule, or number of organisms in a population within a model. A state is a collection of all the state variables of the model for the biosystem at any arbitrary time t. The overall modeling process could be referred to as formulating and adjusting a model structure from both old, new data and using mathematical methods expressing, quantifying, analyzing and validating the structure candidates until they are being resolved into modeling goals. Quantifying is being defined as measuring the quantity of unknowns in order to match the collected data from biosystem experiments. Analyzing is being defined as discovering all important dynamical characteristics of a model and adjusting the model structures or parameter values in order to satisfy the modeling goals. Validating is defined as reanalyzing the obtained information by comparing the measured model outputs with data that are outside of the model. Restructuring is defined as tweaking the model structure when the match has not yet satisfied the modeling goals. Structuring is being defined as organizing distinct system or subsystem components, establishing the coupling and expressing them schematically and mathematically. Model candidates are data collected at input and output ports of the system such as system locations where system dynamics can be stimulated. Physiology is the branch of biology that focuses on study of normal function in living systems and function of the entire system. System physiology focuses on engineering and dynamic system approach in physiology by using explicit modeling and experimental methods. System biology focuses on the biosystem function at cellular and subcellular level with the use of mathematical, computational modeling and experimental methods. Molecular systems biology focuses on study of gene, protein network

and metabolic pathway modeling. System pharmacology uses some math models to characterize the disposition of drugs in the human body. System toxicology refers to study in public policy decisions which are created to protect the environment and health of humans and species. System epidemiology refers to study of how disease affects the health and illness of populations by characterizing the dynamics of disease transmission through modeling. System ecology refers to the study of interaction between one or more organisms and the living environments through modeling.