MATH 390.4 / 650.2 Spring 2019
Philosophy of Modeling Paper

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Due 11:59PM Monday KY604, April 29, 2019

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Pick one of the prompts and argue for one of the choices.

(a) The laws of physics are absolutely true /
The laws of physics are *not* absolutely true /
The laws of physics are *perhaps* absolutely true.

(b) There exists an all-powerful, all-knowing and timeless being or intelligence /
There does *not* exist an all-powerful, all-knowing and timeless being or intelligence /
There *perhaps* exists an all-powerful, all-knowing and timeless being or intelligence.

(c) Global warming is real /
Global warming is *not* real /
Global warming is *perhaps* real.

(d) The optimal human diet for health is [insert a diet here] /
The optimal human diet for health is *not* [insert a diet here] /
The optimal human diet for health is *perhaps* [insert a diet here].

(e) People who smoke contract lung cancer /
People who smoke do *not* contract lung cancer /
People who smoke *perhaps* contract lung cancer.

(f) Autonomous vehicles will navigate perfectly /
Autonomous vehicles will *not* navigate perfectly /
Autonomous vehicles will *perhaps* navigate perfectly.

(g) The government understands the optimal level of taxation /
The government does *not* understand the optimal level of taxation /
The government *perhaps* understands the optimal level of taxation.

(h) The medical establishment understand the human body /
The medical establishment does *not* understand the human body /
The medical establishment *perhaps* understands the human body.

(i) Credit scores like those given by Experian, TransUnion and Equifax are useful /
Credit scores like those given by Experian, etc. are *useless* /
Credit scores like those given by Experian, etc. are *perhaps* useful.

It is your job to interpret the above prompts and redefine them in your own words, i.e. you must *limit, scope* and *concretize* the above which are *deliberately open-ended* and nebulous. To argue your point, you will need to formulate a mathematical model with phenomenon(s) that can be measured (explain how) and characteristics of the units under consideration. You will need to clearly define what "models" are, how your model is mathematical and discuss their limitations. In context of your prompt, you must appropriately explain the concepts we learned / will learn in class, including but not limited to $t, f, g, h^*, \delta, \epsilon, e, t, z_1, \ldots, z_t, \mathbb{D}, \mathcal{H}, \mathcal{A}, n, p, x_{\cdot 1}, \ldots, x_{\cdot p}, x_{1 \cdot}, \ldots, x_{n \cdot}, \mathcal{X}, y, \mathcal{Y}$, supervised learning, the fidelity of the measurement process, extrapolation, interpolation, stationarity, overfitting, validation (in-sample vs. out-of-sample), model selection, machine learning, etc. You are welcome to bring outside sources about philosophy of modeling as well as sources which help make your arguments in support of a prompt. Please cite them appropriately and enter them into a bibilography.

Specs: Your essay must be typed and must be at least 10 pages double-spaced with one inch margin, 12pt Times (or Computer Modern if using LaTeX) and be appropriately organized. You choose a title which will be atop the first page. No need for a title page. Sectioning is at your preference. The bibliography does not count towards the page limit. Keep footnotes to a minimum and do not use endnotes. A physical copy of the paper must be handed in (stapled together).