Tsinghua-Berkeley Shenzhen Institute
Information Inference
Fall 2017

Coursework 6

YOUR NAME April 1, 2018

- **Acknowledgments:** This template takes some materials from course CSE 547/Stat 548 of Washington University: `https://courses.cs.washington.edu/courses/cse547/17sp/index.html`.

  If you refer to other materials in your homework, please list here.

- **Collaborators:** I finish this template by myself. If you finish your homework all by yourself, make a similar statement. If you get help from others in finishing your homework, state like this:
  - 1.2 (b) was solved with the help from _____.
  - Discussion with _____ helped me finishing 1.3.

You may use `enumerate` to generate answers for each question:

6.1. Type of commonly used notations. Use another `enumerate` to start generate answers for sub-questions:

(a) Use `$ $` to get an inline equation: $\mathbb{P}(A) = \mathbb{E}[\mathbb{1}_A(\omega)]$.

(b) Use `equation` to have equation in display math mode:

$$\frac{a+b}{2} \geq \sqrt{ab} \tag{1}$$

(c) Use `\eqref` to get reference for equations: (1) holds when $a \geq 0, b \geq 0$.

(d) Now we would introduce some commonly used notations:

i. Use `\mathbb{P}, \mathbb{R}, \mathbb{E}` to type $\mathbb{P}, \mathbb{R}, \mathbb{E}$.

ii. Use `\mathcal{A}, \mathcal{X}, \mathcal{Y}, \mathcal{N}` to type $\mathcal{A}, \mathcal{X}, \mathcal{Y}, \mathcal{N}$.

iii. Use `\underline{x}, \underline{y}` to type vectors $\underline{x}, \underline{y}$.

iv. Use `\mathsf{x}, \mathsf{y}, \mathsf{z}` to type random variables $\mathsf{x}, \mathsf{y}, \mathsf{z}$. For simplicity, I have defined several macros so you could simply type `\rvx, \rvy, \rvz`. Don't forget `$ $`!

v. Thanks to these macros, we could have $\mathbb{R}, \mathbb{E}[\mathsf{x}], \mathrm{Var}(\mathsf{y}), \mathbb{P}(A), \perp\!\!\!\perp, \mathbb{1}$ by typing `\reals, \E[\rvx], \Var(\rvy), \Prob(A),\independent, \1`.

vi. Now you can use `\ux, \uy, \uz` to type vectors $\underline{x}, \underline{y}, \underline{z}$, and use `\urvx, \urvy, \urvz` to type random vectors $\underline{\mathsf{x}}, \underline{\mathsf{y}}, \underline{\mathsf{z}}$.

vii. Remember that $P_{\mathsf{x}|\mathsf{y}}(x|y) \triangleq \mathbb{P}(\mathsf{x} = x|\mathsf{y} = y)$.