Notation for 6.432 Notes

The following is the relatively straightforward notation used in 6.432 to avoid most of the usual notational collisions experienced with more traditional conventions in such subjects.

Scalar quantities (whether random variables or sample values or constants) are slanted (except uppercase Greek, which are upright, due to limitations of LaTeX). Vector quantities are upright and bold. Random quantities (variables, vectors, processes) are in sans-serif font.

Sample values of same are in regular (serifed) font, as are other nonrandom (deterministic) quantities. As a special case, functions are denoted using regular font, unless the mapping itself is actually random (i.e., for a fixed deterministic argument the function takes different values on different experiments), in which case it is in sans-serif font.

Examples: x, y, H, and $\mathsf{\Theta}$ are random variables, while $\mathbf{x}$, $\mathbf{y}$, and $\mathbf{\Theta}$ are random vectors. Lower case Greek letters are not available in sans-serif fonts in the current version of latex, so we end up having to avoid them.

Examples of scalar samples values (and deterministic quantities) are x, y, H_1, Θ, and $f(\cdot)$, while examples of the determinstic vector quantities are $\mathbf{x}$, $\mathbf{y}$, $\mathbf{\Theta}$ and $\mathbf{f}(\cdot)$.

As a more elaborate use of this notation, an estimator $\hat{x}(\cdot)$ is (almost always in this course) a deterministic function, so the x is in regular font regardless of whether $\hat{x}(\cdot)$ is an estimator for a random or nonrandom quantity. However, when viewed as a function of a random variable y, the quantity $\hat{x}(\mathsf{y})$ is a random variable, so when we suppress the argument for convenience, we use $\hat{\mathsf{x}} = \hat{x}(\mathsf{y})$. The $\hat{x}$ on the right side of the equality is in regular font and the $\hat{\mathsf{x}}$ on the left side is in sans-serif font—both *regardless* of whether the quantity being estimated is random (i.e., x) or nonrandom (i.e., x).

Some other conventions we've attempted to adhere to in the notes are upper case for Fourier transforms and uppercase boldface for matrices. For example, $X(j\omega)$ is the Fourier transform of a deterministic function $x(t)$, while $\mathsf{X}(j\omega)$ is the Fourier transform of a random process $\mathsf{x}(t)$. And $\mathbf{A}$ denotes a matrix, while, consistent with the above, $\mathbf{c}$ denotes a vector. Fortunately, we avoid a source of confusion by not dealing much with vector functions of time in the course.

And finally, we use regular uppercase caligraphic letters like $\mathcal{A}$, $\mathcal{B}$ for sets (i.e., events) in sample space, as well as for spaces and subspaces in abstract vector space.