

ECE 645

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Session 1.A – January 20, 2021



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Detection + Estimation

No text required

Notes follow: Poor, Van Trees, Anderson + Moore
Kay → Vol 1 + 2

HW every 2 or 3 weeks

Exams → 2 take homes ~ 4 to 6 hrs effort with some computation

TE1: some 24 hrs 8am Monday March 8 → 6pm Fri March 12

TE2: " " 8am " April 19 → " " April 23

No final

Project: → proposal 20%
→ final rep. 40%
→ presentation 40%

Final Grade = 10% HW check off
25% TE 1
25% TE 2
40% Project

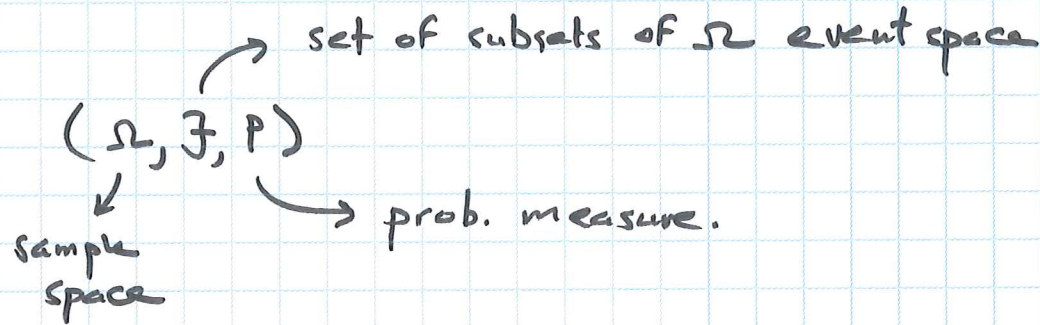
No +/- grades.

Classroom PRCE 277

See Handout on web page \rightarrow "Background Material: LTI, Prob, RPs"

LTI Systems

Probability



\otimes Event space props. $\Omega \in \mathcal{F}$
 $A \in \mathcal{F} \Rightarrow A^c \in \mathcal{F}$
 $A_n, n=1, 2, \dots \in \mathcal{F} \Rightarrow \bigcup_{n=1}^{\infty} A_n \in \mathcal{F}$

} σ -field
 σ -algebra

\otimes prob. meas. props

$$0 \leq P(A) \leq 1$$

$$P(\emptyset) = 0$$

$$P(\Omega) = 1$$

$A_n, n=1, 2, \dots$
 is a disjoint seq.
 of events $\Rightarrow P\left(\bigcup_{n=1}^{\infty} A_n\right) = \sum_{n=1}^{\infty} P(A_n)$

Statistical Independence

$A, B \in \mathcal{F}$ are indep. $\Leftrightarrow P(A \cap B) = P(A)P(B)$.

Sometimes denote $A \cap B \triangleq AB$.

Conditional Probability

$A, B \in \mathcal{F}$

$$P(A|B) = \frac{P(AB)}{P(B)} \quad P(B) > 0.$$

don't care $P(B) = 0$.

Bayes Rule $\{A_1, A_2, \dots, A_n\}$ is a partition of Ω if mutually disjoint & $\bigcup_{i=1}^n A_i = \Omega$

$$P(A_k|B) = \frac{P(B|A_k)P(A_k)}{\sum_{k=1}^n P(B|A_k)P(A_k)}.$$

$P(B) > 0$

Observation: $B \in \mathcal{F}$ st. $P(B) > 0$ and define

$$\tilde{P}(\cdot) = P(\cdot | B)$$

↳ new set function is a valid prob. measure.