ECE 645

J. V. Krogmeier

Session 1.A – January 20, 2021

FORM C
APPROVED FOR USE IN
PURDUE UNIVERSITY

J. V. Krogmeier
jvk@purdue.edu
4-3530

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 8 am Monday March 8 → 6 pm Fri March 12
TE2: " " 8 am " April 19 → " " April 23

No final

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

FORM C
APPROVED FOR USE IN
PURDUE UNIVERSITY

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

No +/− grades.

Classroom PRCE 277

FORM C
APPROVED FOR USE IN
PURDUE UNIVERSITY

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

LTI Systems

Probability

$(\Omega, \mathcal{F}, P)$

Ω: sample space

$\mathcal{F}$: set of subsets of Ω event space

P: prob. measure.

(*) Event space props.

$$\Omega \in \mathcal{F}$$

$$A \in \mathcal{F} \Longrightarrow A^c \in \mathcal{F}$$

$$A_n \;\; n = 1, 2 \ldots \in \mathcal{F} \Longrightarrow \bigcup_{n=1}^{\infty} A_n \in \mathcal{F}$$

σ-field
σ-algebra

(*) prob. meas. props

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

$$P(\phi) = 0$$

$$P(\Omega) = 1$$

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

FORM C
APPROVED FOR USE IN
PURDUE UNIVERSITY

Statistical Independence

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

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

Conditional Probability

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

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

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

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

$P(B) > 0$

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

FORM C
APPROVED FOR USE IN
PURDUE UNIVERSITY

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

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

$\hookrightarrow$ new set function is a valid prob. measure.