How (not) to Give a Talk

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LearnCPS

How (not) to Give a Talk

- Before you start
- Content and Structure
- Slides, Equations, and Media
  - Examples of Bad Practices
- Presentation

Before you start

- Understand the function of your talk
  - Conference, Meeting, Thesis Defense, Job Talk

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  - How many? Background knowledge? Interests?

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- Know the setup
  - In-person/Virtual/Hybrid
  - Room size, Projector/Monitor, Microphone/Camera

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Content and Structure

- Keep it Simple
  - 1.5 main ideas
  - Make people feel smart
  - Make people want to learn more
  - You have forgotten what it was like when you didn't know

Content and Structure

- Emphasize connection over content
  - Tell them what you will tell them
  - Tell them
  - Tell them what you told them
  - Answer the Heilmeier Catechism

Content and Structure



- Heilmeier Catechism
  - What are you trying to do?
  - **Who cares?**
  - How is it done today?
  - What is new to your approach?
  - What are the risks/cost?
  - How do you quantify success?

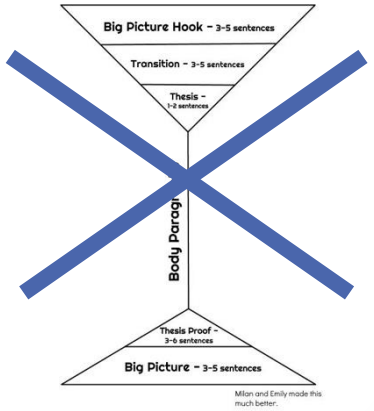
Content and Structure

- Functional Writing
  - No Martini-glass structure
  - Dear Community,

    There is a problem with what you are doing …

    … and you care about it.

    Hear me out



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Slides, Equations, and Media

- Slides
  - Keep lots of white space (16:9)
  - Be consistent with content placement
  - Logos do not need to be there in every slide
  - Limit the content of each slide
  - Use big font size
  - Tip: Use Master Slides

Slides, Equations, and Media

- Equations
  - Use compact and easy to grasp formulas
  - Use visual representations

Example: Equation

random vector $x \in \mathbf{R}^n$ is *Gaussian* if it has density

$$p_x(v) = (2\pi)^{-n/2}(\det \Sigma)^{-1/2} \exp\left(-\frac{1}{2}(v-\bar{x})^T\Sigma^{-1}(v-\bar{x})\right),$$

for some $\Sigma = \Sigma^T > 0$, $\bar{x} \in \mathbf{R}^n$

- denoted $x \sim \mathcal{N}(\bar{x}, \Sigma)$
- $\bar{x} \in \mathbf{R}^n$ is the *mean* or *expected* value of x, *i.e.*,

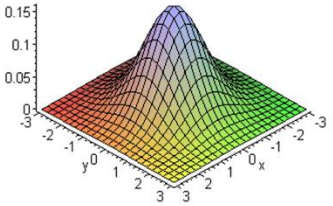
$$\bar{x} = \mathbf{E}\, x = \int v p_x(v) dv$$

- $\Sigma = \Sigma^T > 0$ is the *covariance* matrix of x, *i.e.*,

$$\Sigma \quad = \quad \mathbf{E}(x-\bar{x})(x-\bar{x})^T$$

- **Gaussian Random Vector**

$$p(x) = \frac{1}{\sqrt{(2\pi)^n|\Sigma|}} \exp\left(-\frac{1}{2}(x-\mu)^{\mathrm{T}}\Sigma^{-1}(x-\mu)\right)$$



$X \sim N(\mu, \Sigma)$

- $X \in \mathbb{R}^n$
- mean: $\mu = \mathbb{E}[X] = \int x p(x) dx$
- Covariance matrix: $\Sigma = \Sigma^{\mathrm{T}} = \mathbb{E}\left[(X-\mu)(X-\mu)^{\mathrm{T}}\right]$

Slides, Equations, and Media

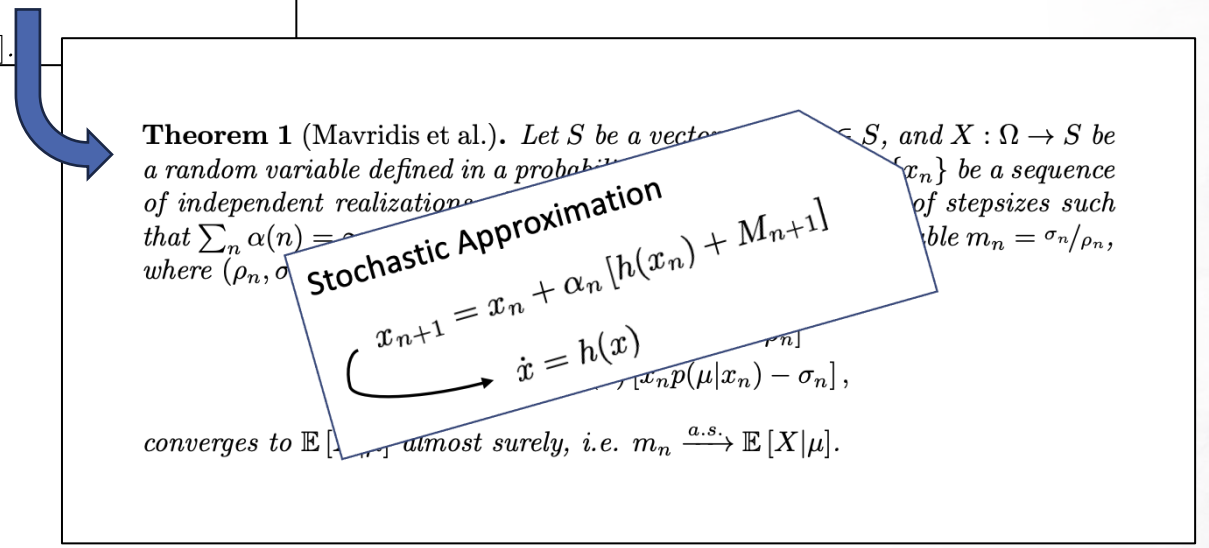
- Equations
  - Use compact and easy to grasp formulas
  - Use visual representations
  - Replace complex theorems with main idea

Example: Theorem

Theorem 1 (Mavridis et al.). *Let S be a vector space, $\mu \in S$, and $X : \Omega \to S$ be a random variable defined in a probability space $(\Omega, \mathcal{F}, \mathbb{P})$. Let $\{x_n\}$ be a sequence of independent realizations of X, and $\{\alpha(n) > 0\}$ a sequence of stepsizes such that $\sum_n \alpha(n) = \infty$, and $\sum_n \alpha^2(n) < \infty$. Then the random variable $m_n = {}^{\sigma_n}/_{\rho_n}$, where (ρ_n, σ_n) are sequences defined by*

$$\rho_{n+1} = \rho_n + \alpha(n)\left[p(\mu|x_n) - \rho_n\right]$$
$$\sigma_{n+1} = \sigma_n + \alpha(n)\left[x_n p(\mu|x_n) - \sigma_n\right],$$

converges to $\mathbb{E}[X|\mu]$ almost surely, i.e. $m_n \xrightarrow{a.s.} \mathbb{E}[X|\mu]$.



Slides, Equations, and Media

- Equations
  - Use compact and easy to grasp formulas
  - Use visual representations
  - Replace complex theorems with main idea
  - Avoid screenshots
  - Use IguanaTex/LatexIt

Slides, Equations, and Media

- Media
  - Do not use too many animations

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  - Use pictures to unclutter the slide, not to clutter it

Example: Figures

Problem Formulation

Ego vehicle dynamics model:

- Non-holonomic unicycle (Dubins) model
- Actuator Limits: Linear/Angular Velocity and Acceleration Constraints

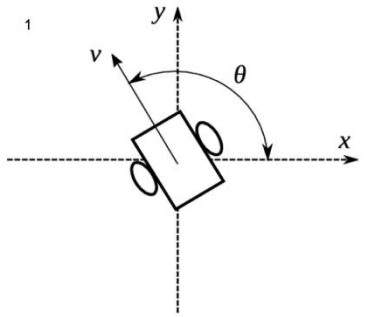
Measurement Model:

- Measured variable: Relative displacement
- Noise Model: Zero-mean Gaussian noise
- Assumption: Constant velocity of non-ego vehicle for the duration of planning horizon

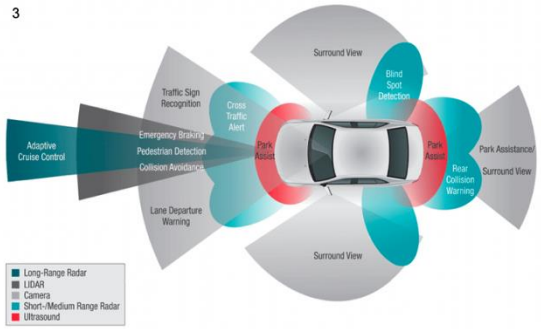
Observation Model:

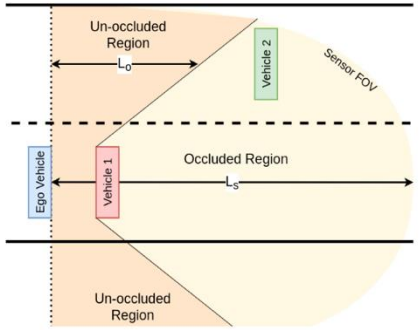
- **Same-lane:** Only the vehicle in direct line of sight (not the ones ahead) is visible given it is in sensor's range
- **Adjacent-lane:** Vehicles in direct line of sight visible but due to occlusion, the sensing range is greatly reduced

1



3



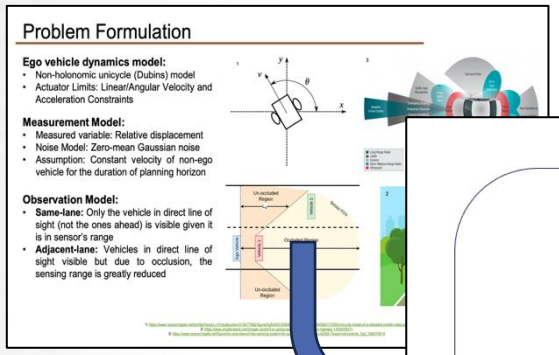


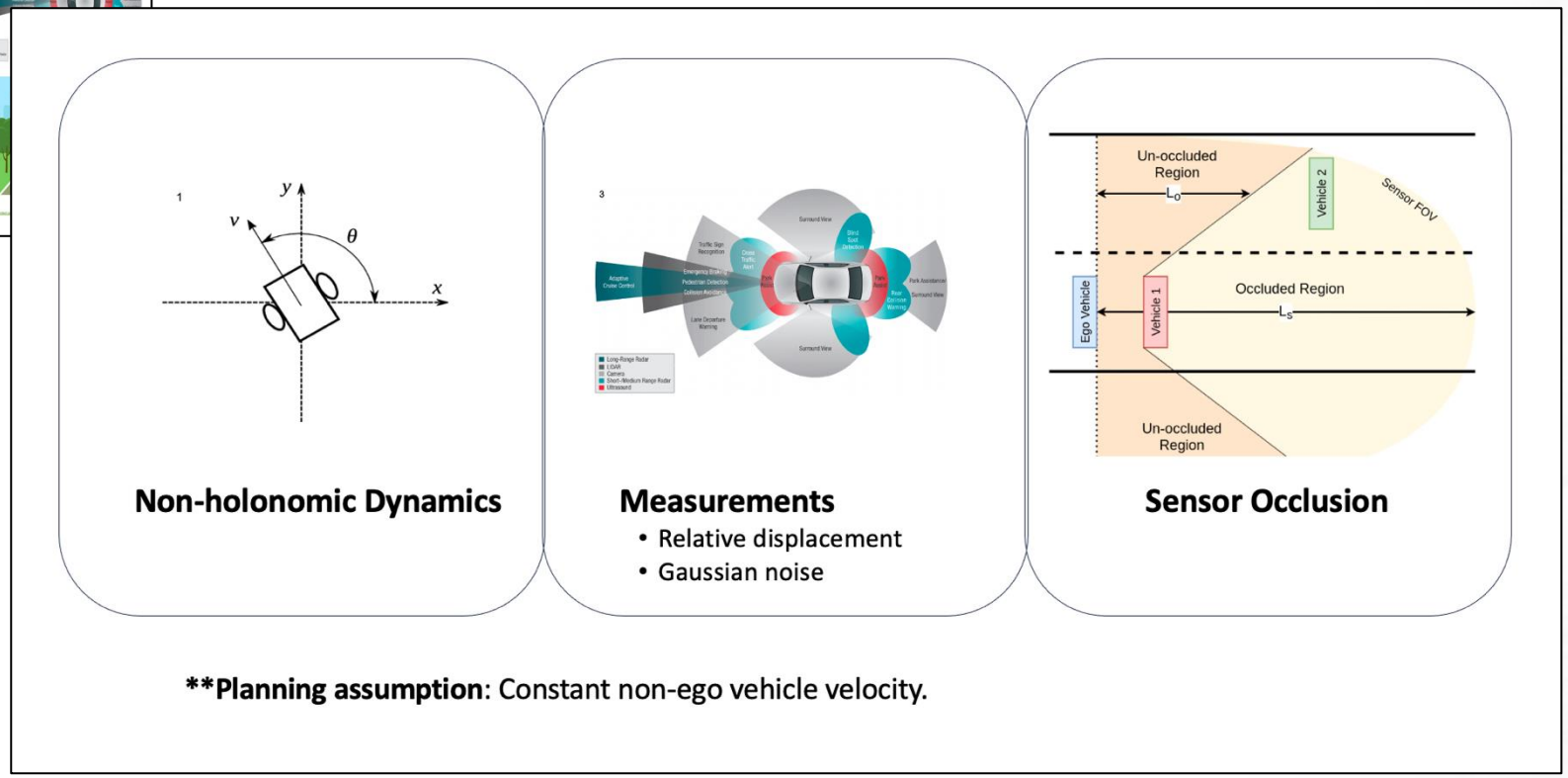
2



1: https://www.researchgate.net/profile/Hang-Li-47/publication/319477982/figure/fig54/AS:535082499624960@1504585017009/Unicycle-model-of-a-wheeled-mobile-robot.png
2: https://www.shutterstock.com/image-vector/car-going-overtake-on-suburban-highway-1455405371
3: https://www.researchgate.net/figure/An-overview-of-the-sensing-system-for-autonomous-vehicles-ADAS-Texas-Instruments_fig2_336070619

Example: Figures





Slides, Equations, and Media

- Media
  - Do not use too many animations
  - Use pictures to unclutter the slide, not to clutter it
  - Videos of experiments are awesome
  - Do not make it too fancy

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Presentation

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  - Do not read the slides

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- Talk Clearly and Loudly

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  - Take-away message
  - Content over which to discuss

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