

# Multiple Object Tracking: Course Outline

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# Outline

- 1 Tracking
- 2 Single Object Tracking
- 3 Multiple Object Tracking
- 4 Random Finite Sets
- 5 Multiple Object Tracking Using Conjugate Pairs

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## 1 Tracking

- Introduction
- Bayesian Filtering
- Motion Modeling
- Measurement Modeling
- Kalman Filter: A Bayesian Filtering Example

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## 2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
- Data Association
- Algorithms
  - Nearest Neighbors
  - Probabilistic Data Association
  - Gaussian Sum Filtering
- Gating

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- ③ Multiple Object Tracking
  - Introduction:  $n$  Object Tracking
  - $n$  Object Measurements Modeling
  - Estimating  $n$  Object Density
  - $n$  Object Data Association
  - Algorithms:  $n$  Object Tracking
    - Global Nearest Neighbors (GNN)
    - Joint Probability Density Association (JPDA)
  - Multi Hypothesis Tracker



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- 4 Random Finite Sets
  - Introduction
  - Common Random Finite Sets
  - Standard Models in MOT
  - Probabilistic Hypothesis Density Filtering
  - Metrics in MOT

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## 5 Multiple Object Tracking Using Conjugate Pairs

- Introduction
- Modeling a Changing Number of Objects
- Multi-Bernoulli Mixture Filter
- Poisson Multi-Bernoulli Mixture Filter
- MOT Filter Implementation
- Labels

## Tentative: Preparation Time

- Tracking: **3 weeks**
- Single Object Tracking: **5 weeks**
- Multiple Object Tracking: **5 weeks**
- Random Finite Sets: **6 weeks**
- Multiple Object Tracking Using conjugate pairs: **6 weeks**