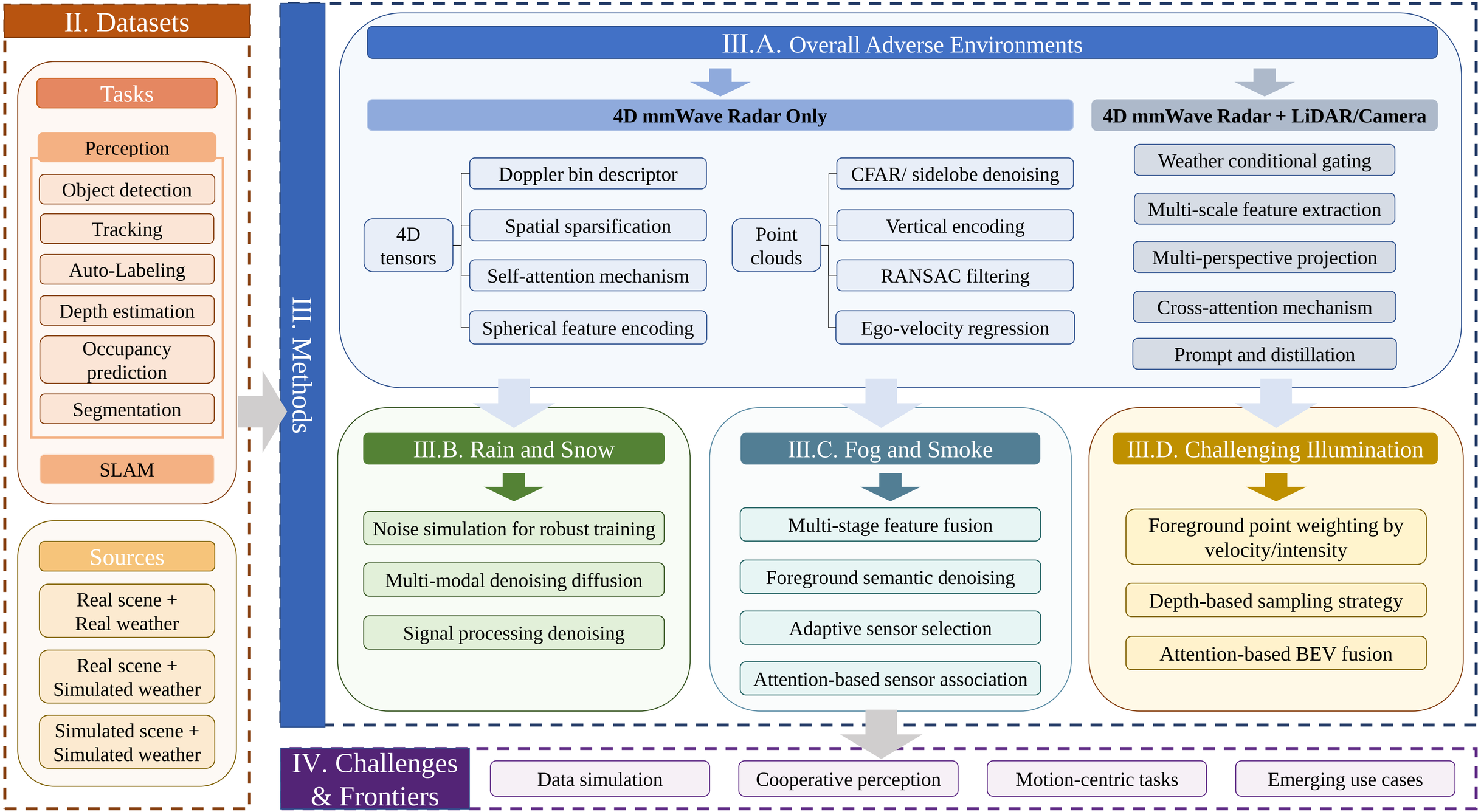
II. Datasets
Tasks
Perception
Object detection
Tracking
Auto-Labeling
Depth estimation
Occupancy prediction
Segmentation
SLAM
Sources
Real scene + Real weather
Real scene + Simulated weather
Simulated scene + Simulated weather
III. Methods
III.A. Overall Adverse Environments
4D mmWave Radar Only
4D tensors
Doppler bin descriptor
Spatial sparsification
Self-attention mechanism
Spherical feature encoding
Point clouds
CFAR/ sidelobe denoising
Vertical encoding
RANSAC filtering
Ego-velocity regression
4D mmWave Radar + LiDAR/Camera
Weather conditional gating
Multi-scale feature extraction
Multi-perspective projection
Cross-attention mechanism
Prompt and distillation
III.B. Rain and Snow
Noise simulation for robust training
Multi-modal denoising diffusion
Signal processing denoising
III.C. Fog and Smoke
Multi-stage feature fusion
Foreground semantic denoising
Adaptive sensor selection
Attention-based sensor association
III.D. Challenging Illumination
Foreground point weighting by velocity/intensity
Depth-based sampling strategy
Attention-based BEV fusion
IV. Challenges & Frontiers
Data simulation
Cooperative perception
Motion-centric tasks
Emerging use cases