Proposal of Special Session

1. Title

Grounded Multimodal Human–Robot Symbiosis for Neurodegenerative Care

2. Aims and Scope

This special session will convene the RO-MAN community around grounded—explicitly anchored in real-world perception, user context, and actionable robot capabilities—multimodal, embodied social AI–robot intelligence, to enable personalized and clinically meaningful support for people living with neurodegenerative conditions (e.g., Alzheimer's disease and related dementias, Parkinson's disease, and ALS) and their formal/informal caregivers.

The topic is timely because multimodal foundation models, affective sensing, and embodied decision-making are making it increasingly feasible to move beyond scripted interactions toward robots that can infer user state, adapt assistance, and sustain engagement over weeks to months. Yet neurodegenerative-care settings impose uniquely hard constraints: high variability in abilities and symptoms, safety and privacy requirements, caregiver workflow integration, and the need for evidence-based interventions and validated outcome measures. These constraints make neurodegenerative care a high-impact proving ground for the RO-MAN 2026 theme, "Realizing Human–Robot Symbiosis with AI," because success requires continuous, bidirectional adaptation between humans and robots in real environments.

We invite contributions on algorithms, interaction designs, systems, and evaluations that integrate multimodal sensing (e.g., speech and prosody, gaze and head pose, gesture and posture, facial and bodily expression, activity and environmental context, and physiological signals where appropriate) with multimodal robot feedback (e.g., dialogue, expressive motion, gaze/attention cues, haptics, tablets/AR) to deliver human-centered care interactions. We particularly encourage papers that report results from deployments in homes, clinics, and long-term care settings, or that advance methodological foundations required to make such deployments reliable.

Topics of interest include (but are not limited to):

- Grounded perception and user-state estimation for cognitive/ affective/ functional changes (including uncertainty quantification)
- Longitudinal personalization: preference learning, ability-aware adaptation, and caregiver-in-the-loop policy shaping
- Embodied interaction policies for assistance, coaching, and companionship (shared autonomy, proactive support, turn-taking)
- Safe and responsible use of LLM/GenAI in care interactions (guardrails, retrieval grounding, bias mitigation, transparency)
- In-the-wild deployment and reliability: robustness, accessibility, edge/embedded AI, privacy-preserving sensing, and failure recovery
- Evaluation in realistic settings: validated outcome measures (engagement, adherence, caregiver burden), short- and long-term studies

- Ethics and human factors: trust calibration, overreliance risk, consent, data governance, and cultural considerations
- Data, benchmarks, and simulation/digital twins that enable reproducible progress while respecting clinical constraints

3. Tentative Speakers

Special Sessions are normally expected to include 4–6 papers. We will actively solicit submissions to ensure adequate volume and diversity and will assemble a balanced program across algorithms, systems, and evaluation. Any co-organizer submissions will undergo the same RO-MAN peer-review process as all other submissions.

1. Adriana Tapus (Institut Polytechnique de Paris): Personalized socially assistive robotics: user–robot adaptation models for cognitive decline
2. Fumihide Tanaka (University of Tsukuba): Social robots for aging societies: multimodal affective interaction and design lessons from real-world settings
3. Momotaz Begum (University of New Hampshire): In-home assistive robotics for Alzheimer's/dementia: robust perception and learning from in-the-wild interactions
4. Tetsunari Inamura (Tamagawa University): Simulation and digital twins for multimodal care interaction: scaling data collection and evaluation for embodied social AI
5. Tetsuya Tanioka (Tokushima University): Clinical and nursing integration of care robots: safety, acceptance, and practice-informed evaluation
6. Fengpei Yuan (Worcester Polytechnic Institute): Robot-mediated cognitive interventions with closed-loop multimodal adaptation for dementia care
7. Ziming Liu (University of Oklahoma): Trustworthy multimodal AI for cognitive-disorder support: grounding, uncertainty, and safety evaluation in HRI
8. Xiaopeng Zhao (University of Mississippi): Embodied social robots for caregiver support and at-home dementia care: personalization, workflow integration, and evaluation

4. Organizers and Biographies

Fengpei (Fiona) Yuan (corresponding organizer)
Assistant Professor, Robotics Engineering Department, Worcester Polytechnic Institute.
Bio: Fengpei (Fiona) Yuan is an Assistant Professor of Robotics Engineering at Worcester Polytechnic Institute, where she directs the Socially Intelligent Robotics for Healthcare (RoboCare) Lab. Her research focuses on socially assistive robots and multimodal human–robot interaction for dementia and aging care, including cognitive and physical exercise, companionship, and daily routine assistance in real-world settings. Her work integrates human-centered AI, affective and multimodal perception, and embodied interaction to enable personalized, longitudinal robot support for people living with neurodegenerative conditions and their caregivers. She has served as a session co-chair and program committee member for international social robotics conferences and actively collaborates with clinicians, caregivers, and interdisciplinary researchers to translate social robot technologies into deployed healthcare applications.

Ziming Liu

Assistant professor, Department of Computer Science, University of Oklahoma.
Bio: Ziming Liu is an Assistant Professor of Computer Science at the University of Oklahoma. His research lies at the intersection of human-centered AI, neurocognitive aging, and multimodal communication, with a focus on interpretable language- and interaction-based markers for Alzheimer's disease and related neurodegenerative conditions. He collaborates closely with neurology and aging research groups across academic medical centers to develop scalable, human-aware AI systems for clinical and caregiving contexts.

Xiaopeng Zhao
Professor and Chair, Department of Mechanical Engineering, University of Mississippi.
Bio: Xiaopeng Zhao holds a Ph.D. in Engineering Science and Mechanics. His research spans AI-enabled robotics and human–robot interaction, including NIH/NIA-backed work on robotic caregivers for Alzheimer's disease and related dementias. He has extensive experience building interdisciplinary healthcare-robotics collaborations and has organized related invited sessions in international social robotics venues. In this special session, he will support broad community outreach, help expand the contributor pool (including under-represented communities), and assist in maintaining rigorous IEEE-standard peer review and conflict-of-interest management.