Collaboration Notes: Prof. Joost Batenburg

Professor - Imaging & Visualization, SAILS Program Director

Background Research

Key Positions & Leadership

1. **SAILS Program Director**
   - Society, Artificial Intelligence and Life Sciences
   - University-wide interdisciplinary AI program
   - Bridge builder between faculties
   - Focus on societal impact of AI
2. **Imaging & Visualization Chair**
   - Leader in tomographic reconstruction
   - FleX-Ray lab director (custom CT systems)
   - Joint appointment with CWI Amsterdam
   - Pioneer in discrete tomography
3. **Major Achievements**
   - NWO Vici grant (€1.5M) for real-time tomography
   - Dutch ICT Research Prize 2018
   - EU COST Action EXTREMA chair (2013-2017)
   - 80+ journal articles, 60+ conference papers

Research Areas

- **Tomographic reconstruction**: 3D imaging from 2D projections
- **Real-time imaging**: Live 3D visualization
- **Cultural heritage**: CT scanning of artworks
- **Computational imaging**: AI for image reconstruction
- **GPU computing**: Large-scale scientific computation

Understanding His Work & SAILS

What is SAILS?

- Leiden's flagship AI program
- Connects AI with social sciences and life sciences
- Focus on responsible AI with societal impact

- Facilitates interdisciplinary collaborations
- Provides funding and infrastructure

Tomography & Visualization

Core Concept: Seeing inside objects without destroying them

- Medical: CT scans, MRI
- Cultural: Artwork analysis
- Industrial: Quality control
- Scientific: Cell imaging

His Innovation: Real-time, high-quality 3D reconstruction using AI

Key Technical Contributions

1. **Discrete Tomography**: Reconstruction with limited data
2. **DART Algorithm**: Discrete Algebraic Reconstruction Technique
3. **Real-time Pipeline**: GPU-accelerated reconstruction
4. **AI Integration**: Deep learning for image enhancement

Concrete Collaboration Ideas

Project 1: API Safety Across Domains via SAILS

Goal: Demonstrate API misuse detection as interdisciplinary AI challenge

Technical Approach:

1. **Multi-Domain Study**:
   - Medical imaging APIs (DICOM, ITK)
   - Cultural heritage APIs (IIIF)
   - Social science APIs (survey tools)
   - Legal AI APIs (document analysis)
2. **Visualization Component**:
   - 3D visualization of API dependency graphs
   - Interactive exploration of misuse patterns
   - Real-time monitoring dashboards
3. **SAILS Integration**:
   - Connect with multiple SAILS members
   - Cross-faculty collaboration

- Societal impact assessment

Why This Matters:

- Positions API safety as university-wide concern
- Access to SAILS funding and network
- His visualization expertise enhances jGuard
- Demonstrates interdisciplinary thinking

Project 2: Visual Analytics for API Usage Patterns

Goal: Create innovative visualizations of API ecosystems

Technical Approach:

1. **3D Reconstruction Metaphor**:
   - Treat API traces as "projections"
   - Reconstruct full usage patterns
   - Apply tomography algorithms to software
2. **Real-time Monitoring**:
   - Live visualization of API calls
   - Pattern detection using imaging techniques
   - GPU-accelerated analysis
3. **Interactive Tools**:
   - VR/AR exploration of API spaces
   - Visual debugging interfaces
   - Educational visualizations

Connection to His Work:

- Applies his imaging algorithms to new domain
- Uses FleX-Ray lab infrastructure
- Novel application of tomography

Project 3: AI Ethics in Automated API Design

Goal: Responsible AI for API generation and verification

Technical Approach:

1. **Ethical Framework**:
   - When should APIs enforce constraints?

- Privacy implications of runtime monitoring
- Fairness in API access control

2. **Visualization of Ethics**:
   - Visual representation of ethical trade-offs
   - Interactive exploration of consequences
   - Stakeholder perspective visualization
3. **SAILS-wide Initiative**:
   - Connect with ethicists, lawyers, social scientists
   - Create guidelines for responsible API design
   - Policy recommendations

Benefits:

- Aligns with SAILS mission
- His role as director provides platform
- Addresses growing AI ethics concerns
- Potential for high-impact publication

How to Present Your Ideas

Opening:

"As SAILS director, you're uniquely positioned to see AI's interdisciplinary challenges. I believe API safety is one such challenge that spans all domains..."

Key Points to Emphasize:

1. **Interdisciplinary Nature**: APIs exist in all fields
2. **Visualization Potential**: Make abstract concepts visible
3. **Societal Impact**: Better APIs = safer AI systems
4. **SAILS Alignment**: Perfect fit for program goals

Visualization Terms to Use:

- **"Reconstruction"**: Building understanding from partial data
- **"Multi-modal"**: Different types of API information
- **"Real-time pipeline"**: Live monitoring and response
- **"3D representation"**: Rich, navigable API landscapes

Questions to Ask Him

1. "How can visualization techniques help developers understand complex API interactions?"
2. "What role should SAILS play in ensuring AI systems are built on solid foundations?"
3. "How do you see the connection between imaging algorithms and software analysis?"
4. "What interdisciplinary collaborations would strengthen API safety research?"

Strategic Advantages of Collaboration

For You:

1. **SAILS Network**: Access to entire university
2. **Visualization Expertise**: New ways to present jGuard
3. **Interdisciplinary Credibility**: Beyond pure CS
4. **Funding Opportunities**: SAILS seed grants
5. **Infrastructure**: GPU clusters, visualization labs

For Him:

1. **New Application Domain**: Software as imaging problem
2. **SAILS Showcase**: API safety as interdisciplinary success
3. **Technical Challenge**: Real-time software visualization
4. **Educational Impact**: Visual learning tools

For SAILS:

1. **Concrete Output**: jGuard as SAILS success story
2. **Cross-faculty**: Connects multiple departments
3. **Societal Relevance**: Safer software for everyone
4. **Innovation**: Novel intersection of fields

Potential Joint Activities

Papers:

1. **"Tomographic Reconstruction of API Usage Patterns"**
   - Venue: IEEE VIS or TVCG
   - Novel visualization approach
2. **"SAILS Vision: Interdisciplinary Approaches to API Safety"**
   - Venue: Nature Machine Intelligence
   - Position paper with multiple SAILS members
3. **"Real-time Visualization of Software Behavior"**

- Venue: ICSE or CHI
- Interactive demonstration

Grants:

- **SAILS Seed Funding**: Quick start for collaboration
- **NWO Perspectief**: Large interdisciplinary program
- **EU Horizon Europe**: AI and Society calls
- **Cultural Heritage**: API safety for digital collections

SAILS Activities:

- Organize API safety workshop
- Cross-faculty seminar series
- Student hackathon on visual debugging
- Industry collaboration day

Understanding His Values

Academic Philosophy:

- **Practical Impact**: Research should solve real problems
- **Interdisciplinary**: Break down silos
- **Open Science**: Share data and methods
- **Innovation**: Push technical boundaries

Leadership Style:

- **Collaborative**: Brings people together
- **Visionary**: Sees big picture
- **Supportive**: Helps others succeed
- **Strategic**: Builds long-term initiatives

Recent Projects to Discuss

1. **FLEXART (2024)**
   - €500K for artwork conservation
   - 3D X-ray of paintings
   - Rijksmuseum collaboration
   - Connect: API safety for cultural heritage
2. **Real-time Tomography Pipeline**

- Vici grant project
- GPU acceleration
- Live 3D reconstruction
- Connect: Real-time API monitoring

3. **Cultural Heritage Imaging**
   - Enables museum CT scanning
   - Published in Nature Communications
   - Democratizing technology
   - Connect: APIs for cultural institutions

Preparation Tips

Before Meeting:

1. Familiarize yourself with SAILS structure and goals
2. Think about visualization metaphors for APIs
3. Prepare ideas for interdisciplinary connections
4. Consider societal impact angles

During Meeting:

- Show enthusiasm for interdisciplinary work
- Emphasize visual and intuitive aspects
- Connect to his imaging background creatively
- Mention specific SAILS members for collaboration

Key Message:

"API safety is an interdisciplinary challenge that SAILS is uniquely positioned to address, combining visualization, AI, and domain expertise"

SAILS Network to Leverage

Key People:

- **Felienne Hermans**: Programming education
- **Boudewijn Lelieveldt**: Medical imaging
- **Serge Rombouts**: Brain imaging
- **Gerard van Westen**: Drug discovery
- **Tessa Verhoef**: Language evolution

Infrastructure:

- SAILS funding mechanisms
- Cross-faculty connections
- Industry partnerships
- Policy maker contacts

Cultural Fit

Dutch Research Culture:

- Collaborative over competitive
- Practical applications valued
- Open science advocate
- Social responsibility important

His Approach:

- Big ideas with concrete steps
- Technology for society
- Breaking boundaries
- Building communities

Final Strategic Points

- He's a connector - use this to access entire university
- SAILS provides funding and legitimacy
- Visualization angle makes your work accessible
- Interdisciplinary framing opens many doors
- Position yourself as SAILS success story in making