Collaboration Notes: Dr. Frank Takes

Associate Professor - Network Science & Director of Education

Background Research

Major Projects & Leadership

1. **POPNET (€1M, 2020-2025)**
   - Population-scale Social Network Analysis platform
   - Academic co-director with CBS (Statistics Netherlands) and UvA
   - Analyzing 17 million inhabitants, 39 billion social ties
   - Building specialized infrastructure for network analysis
2. **Leiden Computational Network Science (CNS) Lab**
   - Founded and leads this research group
   - Focus: Methods and algorithms for network data
   - Website: computationalnetworkscience.org
3. **Educational Leadership**
   - Director of Education for CS and Data Science & AI bachelors
   - LIACS Management Team member
   - Teacher of the Year award (2017)
   - Young eScientist Award (2017)

Research Focus

- **Network Science**: Social network analysis at scale
- **Computational Social Science**: Interdisciplinary approach
- **Applications**: Economics, crime prediction, anonymity
- **Methods**: Graph algorithms, data mining, statistical physics

Understanding Network Science & POPNET

What is Population-scale Network Analysis?

- Analyzing entire populations as networks
- Each person is a node
- Relationships (family, work, neighbors) are edges
- Goal: Understand societal patterns at unprecedented scale

POPNET's Unique Aspects

1. **Scale**: Entire Dutch population (17M people)
2. **Longitudinal**: Track changes over time
3. **Privacy-aware**: Anonymization techniques crucial
4. **Infrastructure**: Custom supercomputer for network analysis
5. **Interdisciplinary**: CS + Social Sciences + Statistics

Key Challenges

- **Computational**: Algorithms for billion-edge graphs
- **Privacy**: Ensuring individual anonymity
- **Methodology**: New techniques for population analysis
- **Interpretation**: Making sense of massive patterns

Concrete Collaboration Ideas

Project 1: API Ecosystem Network Analysis

Goal: Model API dependencies and misuse propagation as networks

Technical Approach:

1. **API Dependency Networks**:
   - Nodes: APIs, libraries, projects
   - Edges: Dependencies, usage patterns
   - jGuard annotations as node attributes
2. **Misuse Propagation Study**:
   - How do bad API practices spread?
   - Network diffusion models
   - Identify "super-spreader" repositories
3. **Intervention Strategies**:
   - Where to introduce jGuard for maximum impact?
   - Network-based targeting
   - Measure cascade effects

Why This Matters:

- Novel perspective on API misuse as "social" phenomenon
- Leverages his network analysis expertise

- Scales jGuard impact through network effects

Project 2: Developer Social Networks and API Quality

Goal: Study how developer networks influence API usage patterns

Technical Approach:

1. **Multi-layer Networks**:
   - Social layer: Developer collaborations
   - Technical layer: API usage patterns
   - Cross-layer effects
2. **Behavioral Analysis**:
   - Do developers copy API patterns from collaborators?
   - Role of "influencer" developers
   - Community detection in API usage
3. **Quality Metrics**:
   - Network position vs. code quality
   - Central developers as quality gatekeepers
   - jGuard adoption patterns

Connection to POPNET:

- Similar multi-layer network approach
- Privacy considerations (developer anonymity)
- Population-scale analysis techniques

Project 3: Anonymity-Preserving API Analytics

Goal: Analyze API usage while preserving developer privacy

Technical Approach:

1. **Anonymization Framework**:
   - Apply POPNET anonymity techniques
   - k-anonymity for API usage patterns
   - Differential privacy for statistics
2. **Network Analysis**:
   - Study API ecosystems without exposing individuals
   - Aggregate patterns while protecting privacy
   - Ethics-first approach

3. **Tool Development**:
    - Privacy-preserving API analytics platform
    - Integration with jGuard telemetry
    - GDPR-compliant design

Benefits:

- Addresses growing privacy concerns
- Enables industry adoption (legal compliance)
- Builds on his ANO-NET project expertise

How to Present Your Ideas

Opening:

"I've been fascinated by your POPNET work and see parallels with API ecosystems. Both involve understanding how practices spread through interconnected systems..."

Key Points to Emphasize:

1. **Network Perspective**: Show you understand network thinking
2. **Scale**: Emphasize population-level insights
3. **Interdisciplinary**: Bridge CS and social perspectives
4. **Educational Impact**: Mention teaching applications

Network Science Terms to Use:

- **"Diffusion"**: How practices spread
- **"Centrality"**: Important nodes in network
- **"Community structure"**: Groups within network
- **"Multi-layer networks"**: Different relationship types
- **"Small-world"**: Six degrees of separation concept

Questions to Ask Him

1. "How do you see API ecosystems as social networks of developers?"
2. "What network metrics would best capture API quality propagation?"
3. "How can we apply POPNET's privacy techniques to developer data?"
4. "What role does education play in shaping developer networks?"

Potential Joint Activities

Papers:

1. **"API Misuse as Network Contagion: A Population-scale Study"**
   - Venue: WWW or ICSE
   - Mining GitHub's social and technical networks
2. **"Privacy-Preserving Analysis of Developer Networks"**
   - Venue: Network Science or TOPS
   - Anonymity in technical collaboration
3. **"The Small World of API Dependencies"**
   - Venue: MSR or SANER
   - Network structure of software ecosystems

Grants:

- **NWO Open Competition**: Network analysis methods
- **EU Digital Europe**: Software supply chain security
- **CBS Partnership**: Official statistics on software

Educational:

- Network analysis course module on API ecosystems
- Student projects on GitHub network mining
- Competitive programming problems on graphs

Understanding His Values

Academic Style:

- **Interdisciplinary**: Bridges multiple fields
- **Applied**: Real-world impact important
- **Educational**: Passionate about teaching
- **Collaborative**: Works across universities

What He Values:

1. **Innovation**: New perspectives on old problems
2. **Scale**: Thinking big (population-level)
3. **Privacy**: Ethical data use
4. **Education**: Training next generation

How to Align:

- Frame API misuse as network science problem
- Emphasize societal impact
- Show teaching enthusiasm
- Respect privacy/ethics concerns

Strategic Advantages

For You:

1. **New perspective**: Network view of API ecosystems
2. **Prestigious project**: POPNET is high-profile
3. **Methods transfer**: Learn population-scale techniques
4. **Interdisciplinary credibility**: Bridge communities

For Him:

1. **New domain**: Software networks understudied
2. **Technical challenge**: Massive GitHub networks
3. **Educational angle**: Teach network thinking to CS students
4. **POPNET extension**: Methods apply beyond social networks

Preparation Tips

Before Meeting:

1. Read his IC2S2 2021 keynote on population-scale networks
2. Look at CNS group publications
3. Think about GitHub as a social network
4. Prepare network visualization of API dependencies

During Meeting:

- Use network terminology naturally
- Show enthusiasm for interdisciplinary work
- Mention teaching interests (he's education director)
- Ask about POPNET infrastructure possibilities

Key Message:

"API ecosystems are socio-technical networks where jGuard can create positive cascades of better practices"

His Network & Collaborations

Key Partners:

- **CBS (Statistics Netherlands)**: Official statistics
- **UvA**: CORPNET group, economic networks
- **Police**: Dark web crime prediction
- **NetSci community**: International network

Infrastructure Access:

- POPNET supercomputer for network analysis
- Could potentially use for GitHub analysis
- Unique computational resources

Recent Work to Discuss

1. **Anonymity in Complex Networks** (Scientific Reports 2024)
   - With Rachel de Jong
   - Structural anonymity measures
   - Apply to developer privacy
2. **Disease Transmission on Networks**
   - How individuals adjust contacts
   - Parallel: How developers avoid "infected" APIs
3. **Dark Web Crime Prediction**
   - Network methods for security
   - Connect to API security concerns

Cultural Fit

Dutch Network Science Community:

- Co-chair of NetSci NL
- Well-connected nationally
- Bridge to European network science

His Approach:

- Rigorous but accessible
- Theory with application
- Open science advocate

- Community builder

Final Strategic Points

- He's building something big (POPNET) - be part of it
- Director of Education - influence on curriculum
- Young and ambitious - good for long-term collaboration
- Unique position bridging CS and social science
- Access to population-scale infrastructure and methods