Pro-ana and pro-mia social networks
The promises of qualitatively-informed agent-based modeling

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Outline

1. Introduction
2. Methodology
3. Model
4. Findings
5. Conclusions
The pro-ana and pro-mia Internet “movement”

- A controversial subculture: advocacy for anorexia and bulimia nervosa on the web.
- How to understand it?
- How to devise suitable health and communication policies?

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Pro-ana and pro-mia social networks
A social networks approach

- Ongoing project: a social networks approach to “ana-mia” sociability.
- Focus is on online vs. offline personal networks and their influence on behavior.
- The present paper is part of this project.
Methodological and ethical challenges

- The pro ana-mia population is:
  - relatively small;
  - vulnerable (health risk; largely underage);
  - partly hidden (disguised/restricted websites; frequent migrations).

- Large quantitative surveys difficult; webcrawling possible only to an extent.

- Need to rely on smaller-scale, purposive sample for qualitative enquiry.
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⇒ How to validate and generalize findings?
Qualitatively-informed agent-based modeling

Combining qualitative data and agent-based computer simulation:

- enriches model with insight into behavior and motivations of actors;
- enriches qualitative analysis by:
  - performing “thought experiments” to test consistency of theories;
  - replicating and generalizing findings from fieldwork;
  - supporting cross-disciplinary validation of results.
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A general analytical framework

Figure: The logic of qualitatively-informed agent-based models in “butterfly” shape
2-way feedback: data-to-model and model-to-data

- Starting point: an actual social process;
- Qualitative sub-loop: formulate hypotheses, collect data, adjust categories, until a theory is produced;
- Design, build, code and de-bug an agent-based model;
- Generate simulated data and revise theory;
- This may direct back to the field (resample and re-start sub-loop).
Empirical data

- Fieldwork with ana-mia subjects is currently in its earlier stage.
- Data collected so far are exploratory, and include:
  - At macro level: a web cartography of pro ana-mia websites in France and UK;
  - At micro level: a qualitative study of network tie formation and social influence on a SNS.
- This paper: use of currently available data to inform a first simulation.
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Use of data for model building and validation

- Insight from preliminary qualitative study is that online network formation may depend upon:
  - Privacy settings, i.e. visibility of contents to others;
  - Self-display, i.e. personal and cultural traits exhibited.
and that traits may change with network composition.

- The model aims to problematize these factors in simulated, larger networks.

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We focus on the impact of:
- tendency to conformism vs. dissonance in cultural traits;
- preference for “bonding” vs. “bridging” in tie formation;
- possibility to limit incoming ties through privacy protection.

We measure impact through:
- number and size of components;
- homogeneity of traits within and between components;
- evolution of privacy settings over time.
Questions, variables and indicators

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Structure of the model: initialization

- At initialization, each actor is endowed with:
  - a vector (several dimensions) of traits;
  - a privacy setting (visible/invisible).

- Actors can be:
  - isolates;
  - connected;

- If connected:
  - they share most traits with their contacts;
  - but may differ on one dimension;
  - this depends on the “Dissonance” parameter.
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Structure of the model: a typical step

- At each step, an actor is randomly selected and makes two choices:
  - relational: form or delete a tie, or no change;
  - behavioral: adjust cultural traits to better fit with group.
- Choices depend on two parameters:
  - Bonding Propensity: whether tie formation/deletion is local or global;
  - Dissonance: extent to which an actor’s traits conform to group.
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We test the following values of parameters:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissonance</td>
<td>0.01 0.03 0.08</td>
</tr>
<tr>
<td>Bonding propensity</td>
<td>0.20 0.50 0.70</td>
</tr>
<tr>
<td>Privacy</td>
<td>On Off</td>
</tr>
</tbody>
</table>
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Three possible configurations

Figure: Three stable configurations: (1) Giant Component, (2) Hegemony and Resistance, (3) Little Boxes
Effects of varying parameters

Figure: Number and size of components with different Dissonance and Bonding Propensity
When privacy protection is not allowed

Figure: Number and size of components, varying Dissonance and Bonding Propensity, no privacy protection
Explain the effects of parameters

- With lower propensity to bonding (=greater openness to bridging), only one or few components emerge;
- This effect is stronger with higher Dissonance;
- With higher propensity to bonding, many small communities emerge;
- In this case, differences in Dissonance have little impact;
- With no privacy protection, these effects are slightly amplified, because more ties can be formed.
Evolution of average privacy

Figure: Average privacy over time, varying Dissonance and Bonding Propensity
Explain changes in privacy over time

- Agents restrict access only when a giant component appears;
- This is the only case in which average privacy increases;
- Otherwise, average privacy diminishes until there are no more isolates, then is stable.
Validation

- Built-in structural validation: simulated micro-behavior based on input from fieldwork.
- Retrodictive validation: can the model reproduce observed data?
- Need to compare our three possible outcomes with web cartography and assess similarities and differences.
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Retrodictive validation

**Figure:** The French pro-anasphere: one large component, minorities, and isolates (by Dr. Manuel Boutet)
The French ana-mia web

- Large component: personal pages and blogs of adolescents and young adults, strongly pro-ana;
- Smaller components: different age groups and positionings (including anti-pro-ana);
- Homogeneity within components, heterogeneity between them;
- Close to our case 2: Hegemony and Resistance.
Explaining this observation

- The model shows that case 2 emerges with:
  - high dissonance;
  - high openness to bridging.

- It suggests that ana-mia subjects:
  - differ from close others (family, friends) on one dimension, i.e. eating;
  - are ready to link with others that share their “dissonant” dimension,
  - do so regardless of other similarities/differences and of distance.

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These are preliminary results: further validation (logical, predictive) is planned.

Still, they support the claim that agent-based models:

- complement analyses based on small qualitative fieldwork;
- enable cross-validation and generalization of findings;
- are tools for empirically-informed theory generation.

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