CROSS-COUNTRY USER CONNECTIONS IN AN ONLINE SOCIAL NETWORK FOR MUSIC

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Rationale

Social connections and cultural aspects play important roles in shaping an individual's preferences. E.g., people tend to select friends with similar music preferences; preferences and friending are influenced by cultural aspects.

Personalized systems may benefit from using knowledge about the nature of social ties for better tailoring to an individual.

The overall research question: Which countries are particularly important for establishing social ties and are, thus, relevant to be considered for taste and preferences for personalized systems?

Methodology

Dataset

- Online social network for music **last.fm** (www.last.fm).
- Subset of *LFM-1b* dataset (www.cp.jku.at/datasets/LFM-1b/):
  - Only users who provide country information.
  - Last.fm API endpoint *user.getFriends* to obtain all connected users. Cross-match friends with users in LFM-1b dataset.
- In total 55,191 users and 1,087,662 user-to-user connections.
- We consider the top 20 countries in terms of total number of users.

Within-country and cross-country user connections

For each pair of countries c_1 and c_2, we compute the share of users in c_1 that are connected to users in c_2. This yields an asymmetric (per-row) normalized *country connection matrix* (cf. table below).

Attractor measure

Attractor measure for a country c = the (relative) amount of users from countries other than c that are attracted to establish connections with users in c.

i.e., the median over all rows in the country connection matrix for the column representing country c.

Which countries have a high proportion of within-country user connections?

Most *within-country user connections:* Poland and Brazil.
Most *transnational* countries: Canada and France.

Which countries' users do highly connect?

- Belarusian and Ukrainian users are well connected to Russians (17.12% and 19.22%, resp.). Russians, though, do not connect to that extent to Belarusians (1.93%) and Ukrainians (4.84%).
- Users from Canada, Australia, and the UK connect a lot to users from the US (26.46%, 16.47%, and 13.37%, resp.). In contrast, the US' only substantial share of cross-country connections is to users from the UK (6.29%).
- We observe that the connected countries share similar cultural, historic, or linguistic backgrounds, or geographic proximity.

What are the most important "attractor" countries?

The *highest attractor values*: US and UK.
The *lowest attractor values*: Belarus and Czech Republic.

Outlook

Findings are a promising source for several fields, e.g.,

- Modeling for personalized systems: May help in cold start scenarios, where little is known about users' social ties.
- Decision-support and information diffusion: Knowing the users' countries may be a good indicator for tie strength prediction.
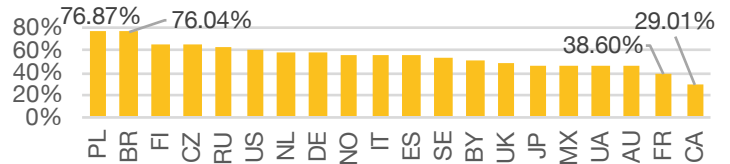
Country connection matrix

For a given row (country c), the values denote the share of connections by users in c maintained with users in all countries (columns).

From ↓ / To →	AU	BR	BY	CA	CZ	DE	ES	FI	FR	IT	JP	MX	NL	NO	PL	RU	SE	UA	UK	US
AU	44.92%	2.66%	0.35%	2.28%	0.32%	2.60%	0.72%	0.86%	0.89%	0.90%	0.69%	0.80%	1.24%	0.66%	1.75%	2.90%	1.01%	0.71%	7.01%	16.47%
BR	0.37%	76.04%	0.20%	0.59%	0.21%	1.53%	0.57%	0.53%	0.48%	0.80%	0.41%	0.81%	0.47%	0.20%	1.73%	1.78%	0.41%	0.49%	2.00%	4.08%
BY	0.55%	2.18%	50.99%	0.59%	0.49%	2.38%	0.52%	0.57%	0.64%	0.73%	0.40%	0.44%	0.52%	0.21%	2.62%	17.12%	0.40%	4.85%	2.14%	3.71%
CA	2.08%	3.85%	0.34%	29.01%	0.36%	3.47%	0.93%	0.88%	1.40%	1.11%	0.94%	0.99%	1.28%	0.55%	2.02%	3.58%	1.14%	1.01%	6.71%	26.46%
CZ	0.44%	2.10%	0.44%	0.55%	64.21%	2.36%	0.45%	0.66%	0.71%	0.93%	0.36%	0.48%	0.67%	0.31%	2.65%	3.48%	0.45%	1.17%	2.85%	3.84%
DE	0.68%	2.86%	0.40%	0.99%	0.44%	56.79%	0.98%	1.12%	1.08%	1.23%	0.59%	0.70%	1.28%	0.51%	2.51%	3.74%	0.94%	1.05%	3.82%	6.89%
ES	0.60%	3.38%	0.28%	0.85%	0.27%	3.12%	54.45%	0.88%	1.07%	1.74%	0.67%	2.05%	1.06%	0.33%	2.22%	2.71%	0.70%	0.63%	4.29%	6.25%
FI	0.57%	2.55%	0.25%	0.64%	0.32%	2.88%	0.71%	65.27%	0.65%	0.90%	0.77%	0.56%	0.83%	0.38%	2.14%	3.16%	1.14%	0.80%	3.00%	4.92%
FR	0.96%	3.72%	0.45%	1.66%	0.56%	4.50%	1.40%	1.05%	38.60%	1.79%	1.28%	1.10%	1.32%	0.54%	3.44%	5.75%	1.12%	1.40%	5.52%	9.12%
IT	0.62%	3.90%	0.32%	0.83%	0.46%	3.21%	1.43%	0.92%	1.13%	54.96%	0.69%	0.81%	1.11%	0.46%	2.62%	3.44%	0.77%	0.88%	4.44%	6.41%
JP	0.91%	3.88%	0.34%	1.35%	0.34%	2.96%	1.06%	1.51%	1.55%	1.32%	47.12%	1.05%	1.14%	0.66%	2.93%	3.98%	0.88%	1.13%	4.14%	9.08%
MX	0.81%	5.91%	0.29%	1.11%	0.35%	2.74%	2.53%	0.85%	1.04%	1.20%	0.81%	46.68%	0.82%	0.30%	2.57%	3.11%	0.68%	0.69%	3.09%	8.82%
NL	0.88%	2.38%	0.24%	0.99%	0.34%	3.48%	0.91%	0.88%	0.87%	1.15%	0.61%	0.57%	57.20%	0.61%	2.60%	2.60%	0.89%	0.69%	4.53%	7.26%
NO	1.08%	2.29%	0.22%	0.98%	0.36%	3.15%	0.65%	0.92%	0.81%	1.10%	0.82%	0.48%	1.39%	55.68%	2.77%	2.81%	2.06%	0.86%	4.76%	7.56%
PL	0.27%	1.94%	0.26%	0.35%	0.30%	1.51%	0.42%	0.50%	0.50%	0.60%	0.35%	0.39%	0.58%	0.27%	76.87%	1.98%	0.35%	0.70%	2.37%	2.62%
RU	0.51%	2.23%	1.93%	0.69%	0.44%	2.51%	0.57%	0.83%	0.93%	0.88%	0.53%	0.53%	0.64%	0.30%	2.21%	62.80%	0.50%	4.84%	2.67%	4.88%
SE	1.00%	2.92%	0.26%	1.23%	0.32%	3.57%	0.83%	1.69%	1.02%	1.11%	0.66%	0.65%	1.23%	1.25%	2.21%	2.79%	53.96%	0.76%	4.56%	8.25%
UA	0.49%	2.44%	2.17%	0.77%	0.59%	2.81%	0.53%	0.83%	0.90%	0.90%	0.60%	0.47%	0.67%	0.37%	3.12%	19.22%	0.53%	46.09%	2.61%	4.81%
UK	1.59%	3.24%	0.31%	1.66%	0.47%	3.32%	1.17%	1.02%	1.15%	1.47%	0.72%	0.68%	1.44%	0.66%	3.44%	3.44%	1.05%	0.85%	47.52%	13.37%
US	1.76%	3.11%	0.25%	3.09%	0.30%	2.82%	0.81%	0.79%	0.90%	1.00%	0.74%	0.92%	1.09%	0.50%	1.78%	2.97%	0.89%	0.74%	6.29%	59.77%