Authorship Contribution Dynamics on Publication Venues in Computer Science: an Aggregated Quality Analysis

Thiago H. P. Silva, Mirella M. Moro and Ana Paula C. Silva

UNIVERSIDADE FEDERAL DE MINAS GERAIS, Brazil
Motivation

Collaboration Behaviors
Motivation

Collaboration Behaviors

Area Diversity
Motivation

Collaboration Behaviors

Area Diversity

Hot Topics
Motivation

Collaboration Behaviors

Hot Topics

Area Diversity

Complex Networks
Motivation

Collaboration Behaviors

Area Diversity

Complex Networks

Individual and Collective Researchers’ Impact

Hot Topics
Motivation

Analyzing the patterns underlying scientific communities is important for understanding the own evolution of science.
Motivation

Analyzing the patterns underlying scientific communities is important for understanding the own evolution of science.

Dynamics of Authors within Communities given by Publication Venues
Contribution Dynamics

Analyzing the Dynamics of Authors within Communities given by Publication Venues
Contribution Dynamics

Analyzing the Dynamics of Authors within Communities given by Publication Venues
Contribution Dynamics

Quotas of Contribution

Ideas
Contribution Dynamics

Quotas of Contribution

- Ideas
- Funding
Contribution Dynamics

Quotas of Contribution

- Ideas
- Funding
- Resources
Contribution Dynamics

Quotas of Contribution

- Ideas
- Funding
- Resources

Venue 1

Venue n
Venues have different collaboration patterns:
- diverse areas of interest;
- number of researchers;
- rate of publications...
Contribution Dynamics

Venues have different collaboration patterns:
- diverse areas of interest;
- number of researchers;
- rate of publications...

Fairer Comparison Properties:
- Equality ($P1$);
- Relativity ($P2$);
- Temporality ($P3$);
Contribution Dynamics

Authorship Contribution

\[ C_w = \frac{1}{|A_w|} \]
Contribution Dynamics

Authorship Contribution

\[ C_w = \frac{1}{|A_w|} \]

Temporal Contribution

\[ C_a(t) = \frac{1}{|A(t)|} \sum_{\forall w \in W_a(t)} C_w \]
Contribution Dynamics

Authorship Contribution Dynamics

\[ C_{av}(T) = \{ C_{av}(1), C_{av}(2), \ldots , C_{av}(T) \} \]
Contribution Dynamics

Authorship Contribution Dynamics

\[ C_{av}(T) = \{ C_{av}(1), C_{av}(2), \ldots, C_{av}(T) \} \]

- Permanency
- Migration
Contribution Dynamics

Permanency.

\[ P_v(t) = \frac{1}{C_v(t)} \sum_{\forall a \in A(t)} \min(C_{av}(t - 1), C_{av}(t)) \]
Contribution Dynamics

Permanency.

\[ P_v(t) = \frac{1}{C_v(t)} \sum_{\forall a \in A(t)} \min(C_{av}(t - 1), C_{av}(t)) \]

\[ C_v(t) = \frac{1}{|A(t)|} \sum_{\forall a \in A(t)} C_{av}(t) \]
Contribution Dynamics

Permanency.

\[
P_v(t) = \frac{1}{C_v(t)} \sum_{\forall a \in A(t)} \min(C_{av}(t-1), C_{av}(t))
\]

\[
C_v(t) = \frac{1}{|A(t)|} \sum_{\forall a \in A(t)} C_{av}(t)
\]

If researcher \(a_1\) contributes to venue \(v_1\) with 10% of his effort at \(t-1\), and his contribution raises to 25% at \(t\), then 10% of his effort remains in \(v_1\).
Contribution Dynamics

Migration.

\[ M_{(v_i, v_j)}(t) = \frac{1}{|A_{v_i}(t)|} \sum_{\forall a \in A(t)} M_a(t) \]

\[ M_a(t) = \{ (v_i, v_j, \delta_{ij}) | \forall (v_i, v_j) \in \{ V_a(t - 1) \times V_a(t) \} \} \]
Contribution Dynamics

Example: Migration of a author a

\[ t-1 \]
\[ v_1: 22\% \]
\[ v_2: 75\% \]
\[ v_3: 2\% \]
\[ v_4: 1\% \]

\[ t \]
\[ v_1: 16\% \]
\[ v_2: 80\% \]
\[ v_3: 1\% \]
\[ v_4: 3\% \]
Contribution Dynamics

Example: Migration of a author a

<table>
<thead>
<tr>
<th>t-1</th>
<th>t</th>
<th>Donors</th>
<th>Receivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>v1: 22%</td>
<td>v2: 5%</td>
</tr>
<tr>
<td>v1:</td>
<td>v1:</td>
<td>v1: 6%</td>
<td>v1: 16%</td>
</tr>
<tr>
<td>22%</td>
<td>16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v2:</td>
<td>v2:</td>
<td>v2: 80%</td>
<td>v2: 75%</td>
</tr>
<tr>
<td>75%</td>
<td>80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v3:</td>
<td>v3:</td>
<td>v3: 1%</td>
<td>v3: 75%</td>
</tr>
<tr>
<td>2%</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v4:</td>
<td>v4:</td>
<td>v4: 3%</td>
<td>v4: 75%</td>
</tr>
<tr>
<td>1%</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Contribution Dynamics

Example: Migration of a author a

Donors
- $v_1$: 6%
- $v_3$: 1%

Receivers
- $v_2$: 5%
- $v_4$: 2%
Contribution Dynamics

Example: Migration of a author $a$

Donors

$\nu_1: 6\%$

$\nu_3: 1\%$

Receivers

$\nu_2: 5\%$

$\nu_4: 2\%$

Minimum Value
Contribution Dynamics

Example: Migration of a author $a$

Donors

$\nu_1: 6\%$

$\nu_3: 1\%$

Receivers

$\nu_2: 5\%$

$\nu_4: 2\%$

Equally

Donations

and

Receipts

$Ma = \{(\nu_3, \nu_2, 0.5\%), (\nu_3, \nu_4, 0.5\%)\}$

$v_1: 6\%$

$v_2: 4.5\%$

$v_4: 1.5\%$
Contribution Dynamics

Example: Migration of a author $a$

Donors

$\nu_1$: 6%
$\nu_3$: 1%

Receivers

$\nu_2$: 5%
$\nu_4$: 2%

$Ma = \{(\nu_1, \nu_4, 1.5\%), (\nu_3, \nu_2, 0.5\%), (\nu_3, \nu_4, 0.5\%)\}$

$\nu_1$: 6%
$\nu_2$: 4.5%
$\nu_4$: 1.5%

$\nu_1$: 4.5%

$\nu_2$: 4.5%
Contribution Dynamics

Example: Migration of a author $a$

\[ M_a = \{(v_1, v_2, 4.5\%), (v_1, v_4, 1.5\%), (v_3, v_2, 0.5\%), (v_3, v_4, 0.5\%)\} \]
Contribution Profiles

Exclusivity

Plurality
Contribution Profiles

Exclusivity.

\[ E_v(t) = \frac{1}{C_v(t)} \sum_{a \in \{ A(t) \mid C_a(t) = C_{a_v}(t) \}} C_a(t) \]
Contribution Profiles

Exclusivity.

\[ E_v(t) = \frac{1}{C_v(t)} \sum_{\forall a \in \{ \mathcal{A}(t) | C_a(t) = C_{a_v}(t) \}} C_a(t) \]

For instance, an exclusivity factor of 10% means that 10% of the total contribution in that venue is performed by exclusive researchers.
Contribution Profiles

Plurality.

\[ Pl(v_i, v_j, t) = \frac{1}{|A(t)|} \sum_{a \in A(t)} min(C_{av_i}(t), C_{av_j}(t)), \forall (v_i, v_j) \]
Contribution Profiles

**Plurality.**

\[ Pl(v_i, v_j, t) = \frac{1}{|A(t)|} \sum_{\forall a \in A(t)} \min(C_{av_i}(t), C_{av_j}(t)), \forall (v_i, v_j) \]

For example, author \( a \) has 10% in venue \( v_1 \) and 15% in \( v_2 \), the intersection of \( v_1 \) and \( v_2 \) corresponds to the contribution of author \( a \), which is \( \min(10\%, 15\%) = 10\% \)
Analysis

Contribution Dynamics on Publication Venues in Computer Science
Analysis

Contribution Dynamics on Publication Venues in Computer Science

Datasets.

- Excellence in Research for Australia;
- Qualis;
- DBLP.
### Contribution Dynamics on Publication Venues in Computer Science

#### ERA in DBLP

<table>
<thead>
<tr>
<th>class</th>
<th>Conf.</th>
<th>Jour.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>218</td>
<td>95</td>
</tr>
<tr>
<td>B</td>
<td>210</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>244</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>672</strong></td>
<td><strong>213</strong></td>
</tr>
</tbody>
</table>

#### Qualis in DBLP

<table>
<thead>
<tr>
<th>class</th>
<th>Conf.</th>
<th>Jour.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>109</td>
<td>53</td>
</tr>
<tr>
<td>A2</td>
<td>112</td>
<td>38</td>
</tr>
<tr>
<td>B1</td>
<td>210</td>
<td>50</td>
</tr>
<tr>
<td>B2</td>
<td>116</td>
<td>38</td>
</tr>
<tr>
<td>B3</td>
<td>90</td>
<td>17</td>
</tr>
<tr>
<td>B4</td>
<td>81</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>718</strong></td>
<td><strong>196</strong></td>
</tr>
</tbody>
</table>
Analysis

Contribution Dynamics: Authorship Contribution
Analysis

Contribution Dynamics: Authorship Contribution
Analysis

Contribution Dynamics: Authorship Contribution
Analysis

Contribution Dynamics: Authorship Contribution
Analysis

Contribution Dynamics: Authorship Contribution
Analysis

Contribution Dynamics: Permanency
Analysis

Contribution Dynamics: Permanency
Analysis

Contribution Dynamics: Permanency
Analysis

Contribution Dynamics: Permanency
Analysis

Contribution Dynamics: Permanency
Analysis

Contribution Dynamics: Migration
Analysis

Contribution Dynamics: Migration
Analysis

Contribution Dynamics: Migration
Analysis

Contribution Dynamics: Migration

![Chart showing migration contribution dynamics from 1971 to 2011. The chart displays the proportion of migration over the years for different classes: CC, CB, and CA.](chart.png)
Analysis

Contribution Profiles: Exclusivity
Analysis

Contribution Profiles: Exclusivity
Analysis

Contribution Profiles: Exclusivity
Analysis

Contribution Profiles: Exclusivity
Analysis

Contribution Profiles: Exclusivity

[Graph showing contribution profiles over years]
Analysis

Contribution Profiles: Plurality
Analysis

Contribution Profiles: Plurality

![Graph showing Contribution Profiles: Plurality over years with different classes A1B4, A1B3, A1B2, A1B1, A1A2, and A1A1 with varying proportions.](image-url)
Analysis

Contribution Profiles: **Plurality**

Graph showing the proportion of plurality over time for different classes, with Class A2 highlighted.
Analysis

Contribution Profiles: Plurality

![Graph showing contribution profiles over years]
Analysis

Contribution Profiles: Plurality
Analysis

Contribution Profiles: Plurality
Analysis

Contribution Profiles: Plurality

![Graph showing contribution profiles over time for different classes. The y-axis represents the proportion of plurality, ranging from 0% to 100%. The x-axis represents years from 1970 to 2010. Each class is represented by a different shade of gray. Class B4 is highlighted.](image-url)
Conclusions

- venues better classified attract more researchers’ attention;
Conclusions

- venues better classified attract more researchers’ attention;
- permanency is more visible in conferences than in journals, although it is smaller in conferences than journals;
Conclusions

- venues better classified attract more researchers’ attention;
- permanency is more visible in conferences than in journals, although it is smaller in conferences than journals;
- permanency has increased over the years, suggesting that researchers have created stronger connections with their venues;
Conclusions

- venues better classified attract more researchers’ attention;
- permanency is more visible in conferences than in journals, although it is smaller in conferences than journals;
- permanency has increased over the years, suggesting that researchers have created stronger connections with their venues;
- the proportion of migrations tend to be higher for top venues.
Conclusions

Researchers do move their authorship contribution around venues focusing in the highest quality ones, with conferences having more diverse contributions and journals a more defined core.
Authorship Contribution Dynamics on Publication Venues in Computer Science: an Aggregated Quality Analysis

Thiago H. P. Silva, Mirella M. Moro and Ana Paula C. Silva
UNIVERSIDADE FEDERAL DE MINAS GERAIS, Brazil