KDD 2012 BEIJING
THE 18TH ACM SIGKDD CONFERENCE ON KNOWLEDGE DISCOVERY AND DATA MINING
Beijing, China August 12-16, 2012

PatentMiner: Topic-dirven Patent Analysis and Mining

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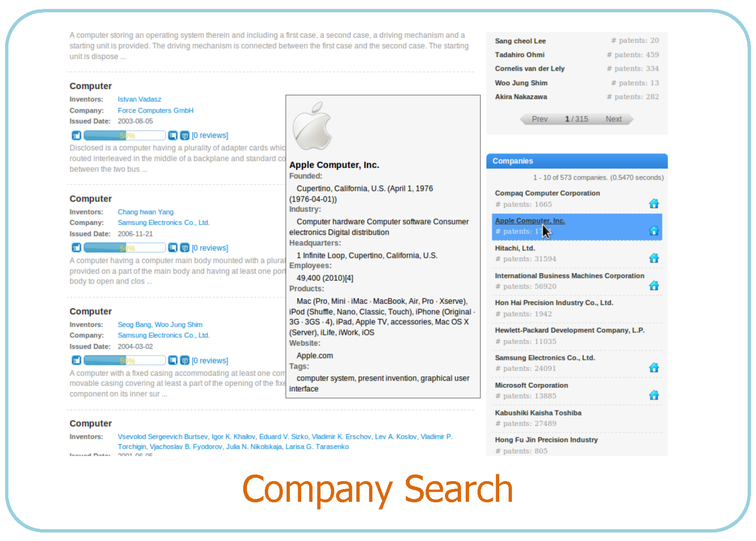
Introduction

PatentMiner is a free online service used for analyzing and mining patent networking data. By now, we collected 8,000,000+ patents, 400,000+ companies, 2,000,000+ inventors. PatentMiner provides in-depth topic-level analysis functions.

System Overview



Company Search

Major functions in PatentMiner:

❑Patent Search

Find prolific inventors, top company, and best patent

❑Company Analysis

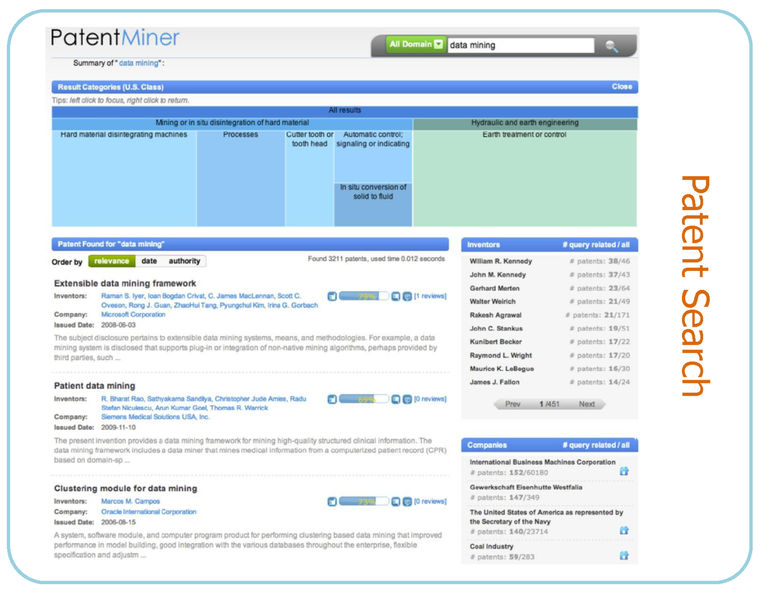
Extract company basic information, and discover topic evolution

❑Topic Cataloging

Model patents and companies with mixture topic distribution

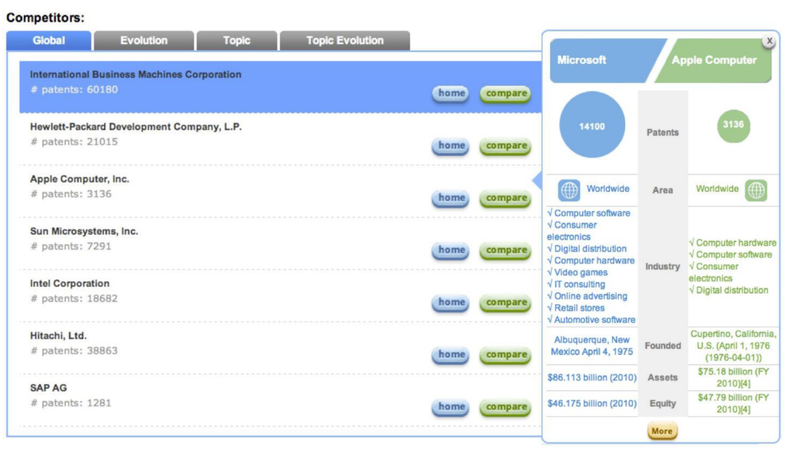
❑Competitive Analysis

Identify your competitors and analyze their technology evolution

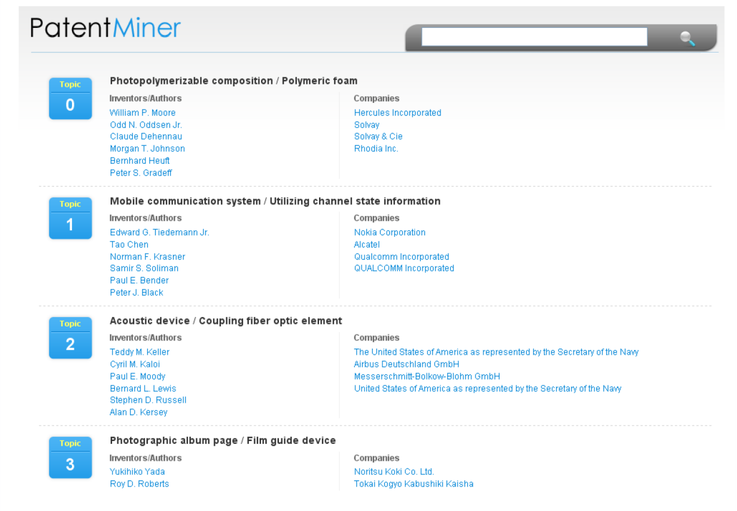


Patent Search

Company Trend



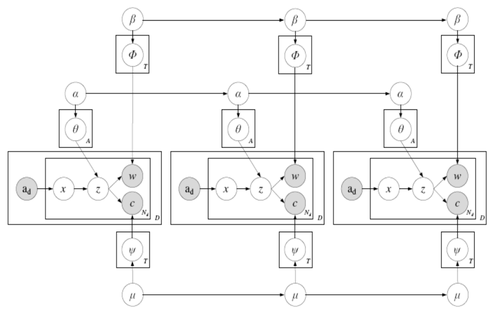
Competitor Analysis



Topic Browser

Technique Issue

Modeling Patent Network



Dynamic Inventor-Company-Topic Model

Inventor-topic smoothing $\Omega_1 = \sum_z (\theta_{az}^t - \theta_{az}^{t-1})^2$

Company-topic smoothing $\Omega_2 = \sum_z (\psi_{cz}^t - \psi_{cz}^{t-1})^2$

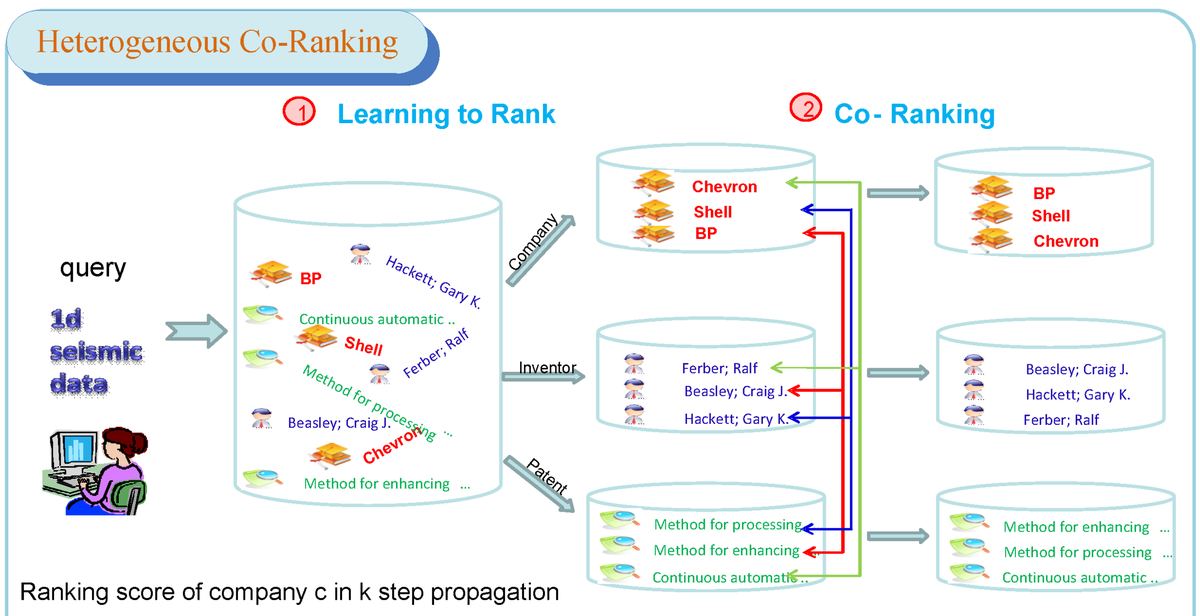
Topic smoothing $\Omega_3 = \sum_z (P(z)^t - P(z)^{t-1})^2$

Objective function

$$\mathcal{O}(\mathbf{D}) = -\mathcal{L}(\mathbf{D}) + \gamma_1\Omega_1 + \gamma_2\Omega_2 + \gamma_3\Omega_3$$

$$\mathcal{L}(\mathbf{D}) = P(\mathbf{x},\mathbf{z},\mathbf{w},\mathbf{c}|\Theta,\Phi,\Psi,\mathbf{a}) = \prod_{d=1}^{M}\prod_{i=1}^{N_d}\frac{1}{A_d} \times \prod_{z=1}^{K}\left(\prod_{x=1}^{A}\theta_{xz}^{m_{xz}}\prod_{j=1}^{W}\phi_{zw_j}^{n_{zw_j}}\prod_{c=1}^{C}\psi_{zc}^{n_{zc}}\right)$$

Heterogeneous Co-Ranking



Ranking score of company c in k step propagation

$$r^k[c] = (1-\xi_1-\xi_2)r^{k-1}[c] + \frac{\xi_1}{|V_a^c|}\sum_{d\in V_a^c} r^{k-1}[a] + \frac{\xi_2}{|V_d^c|}\sum_{d\in V_d^c} r^{k-1}[d]$$

Experimental results

Object	Method	P@1	P@5	MAP	N@1	N@5
Patent	LM	.7001	.6900	.6991	.7021	.6833
	HCR-1	.7592	.7102	.7359	.7592	.7310
	HCR-2	.7598	.7201	.7361	.7600	.7300
	HCR-5	.7600	.7298	.7400	.7678	.7367
Company	LM	.6931	.6790	.6654	.6888	.6532
	HCR-1	.7167	.6833	.7058	.7167	.6934
	HCR-2	.7189	.6900	.7100	.7200	.7000
	HCR-5	.7201	.6999	.7210	.7201	.7031

Competitor Analysis

Method 1: topic comparison based on DICT

Global Competitor Analysis

$$S(c,c') = (\sum_{i=1}^{n} p(z_i|c)p(c'|z_i))^2 + \eta(|\mathcal{D}_c| - |\mathcal{D}_{c'}|)^2$$

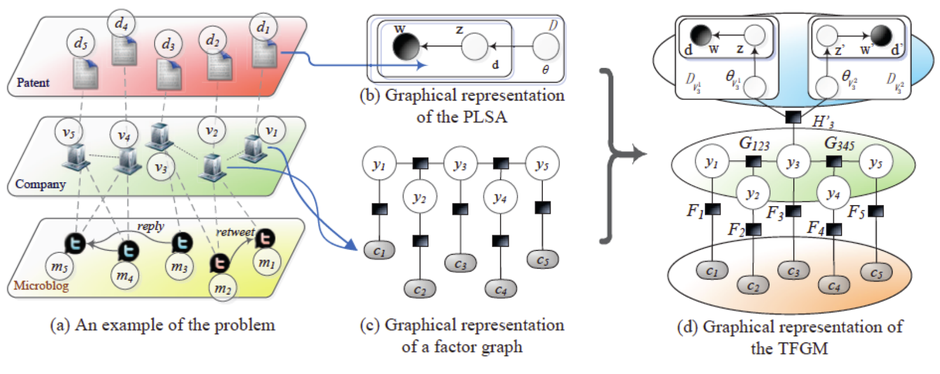
Topic-level Competitor Analysis

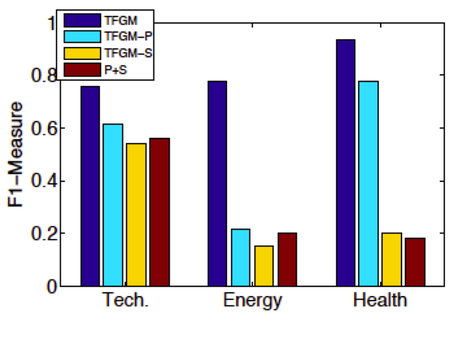
$$S(c,c',z) = (p(c|z) - p(c'|z))^2 + \eta(\sum_{d_i\in\mathcal{D}_{cz}} p(d_i|z) - \sum_{d_j\in\mathcal{D}_{c'z}} p(d_j|z))^2$$

	Methods	P@1	P@5	MAP	N@1	N@5
Global	WBS	.2009	.1087	.2904	.2009	.2841
	TopCom+TBD	.1731	.0846	**.3078**	.1731	.2871
	TopCom+PBC	**.2098**	**.1161**	.2920	**.2098**	**.3085**
Topic	LM+LDA	.1536	.1221	.2643	.1536	.2524
	TopCom+DBC	.1369	.1270	.2388	.1469	.2446
	TopCom+HBC	**.1620**	**.1366**	**.2781**	**.1620**	**.2874**

Experimental results

Method 2: combing patent records and social medias





Patent and social media contribution

Topic	Words	Competitors
Topic #4	image graphics pixel 3d	NVIDIA Vs. Autodesk
		Adobe Vs. VMware
		VMware Vs. Autodesk
		Microsoft Vs. NVIDIA
Topic #31	database distributed query domain	Oracle Vs. Jabil Circuit
		Yahoo! Vs. Jabil Circuit
		Google Vs. Jabil Circuit
		Microsoft Vs. Google
Topic #76	semiconductor toner compositions chamber	Novellus Systems Vs. Intel
		First Solar Vs. CREE
		Applied Materials Vs. IBM
		Motorola Vs. CREE

Examples of topic-level competitors

Paper ID: 315