Agenda

- Introduction
- Automated Patent Classification @ Evalueserve IP and R&D Projects
- Use Cases & Key Findings
- Appendix
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IP and R&D Business Unit
- Director Evalueserve Netherlands
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- Joined Evalueserve in April 2015
- Former CEO Treparel
- Bachelor Small Business Management (Haarlem)

Dr. Fedde van der Lijn
Solution Engineer
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- Global Competence Centre for Text Mining IP R&D
- The Hague, The Netherlands
- Joined Evalueserve in April 2015
- Former Head of Solutions at Treparel
- PhD in Biomedical Image Analysis (Rotterdam)

- Treparel developed KMX Patent Analytics in close cooperation with Royal Dutch Philips (2007)
- Evalueserve is a global professional services provider offering research, analytics and data management services.
- With over 3,200 professionals worldwide we are powered by mind+machine™ – a unique combination of human expertise and best-in-class technologies.
Our solutions for Global Leaders in IP and R&D
Automated Patent Classification @ Evalueserve IPR+D
Typical Evalueserve IPR+D project workflow

1. **Search and Import**
   - Search and import potentially relevant documents from 3rd party data sources

2. **Filter and Tag**
   - Review and identify relevant and non-relevant documents.
   - Label documents to the Evalueserve Tagging framework

3. **Client Review**
   - Clients have option to review filtering and tagging results
   - Review workflows can be adjusted to client operations

4. **Report & Deliver**
   - Create online reports and share project with end users
   - Single client repository for all IP and R&D data: relevant and tagged

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Evalueserve IPR+D Intelligence Solution: i.e. Patent Landscape

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Filtering and tagging

I.e. patent landscape on OLED technology

Broad result set
(based on keyword, IPC queries)

Narrow result set

Tagged result set

Filtering
Comparable to preclassification

Tagging
Comparable to reclassification

KMX Classifiers

US9287331B2

US9287528B2
tag1 tag2 tag3 tag4

US9287528B2
How do KMX classifiers work?

- KMX classifiers are based on a word fingerprint (~1000 most prominent terms in broad result set)
- Classifiers need to be trained using manually tagged examples
  - Filtering: relevant / non-relevant
  - Tagging: i.e. Fast Response / Lifespan / Low Power / …
- Obtain training data by:
  - Tagging a subset of the broad result set
  - Using previous analyses

Diagram:
- Broad result set
- Previously labelled patents
- Inspect and label subset
- Train KMX Classifier
- Review and refine
- Apply KMX Classifier
- Narrow/Tagged result set
How do KMX classifiers work?

- After training classifiers can run automatically
  - Option to review and refine the training set to improve results
- KMX classifiers generate tag probabilities
  - Filtering: i.e. 95% relevant / 5% non-relevant
  - Tagging: i.e. 67% Fast Response / 12% Lifespan / 15% Low Power / 6% …
How does Evalueserve IPR+D use KMX classifiers?

• Specific workflow depends on client requirements:
  • Mind + Machine workflows
    • **Accuracy** is key requirement
    • Possible workflows
      • Classifiers provide first tags, expert reviews
      • Classifiers and expert both provide tags, expert reviews discrepancies
      • Example use cases can be found in appendix
  • Machine only workflows
    • **Efficiency** is key requirement
Machine-only use cases
Case Study 1 – Portfolio Categorization
Automatically assign technology tags to patent portfolio

Organization
Multinational technology and services company

Industry
Telecommunication Equipment

Function(s)
IP Licensing

Geography
HQ in Europe

Business Challenge>
• Client wanted to categorize its own patent portfolio across 26 technical categories
• Client had limited budget for the activity, and wanted the analysis to be done quickly

Solution >

1. Building KMX classifiers
   - KMX classifiers corresponding to 26 technical categories were identified and verified by performing manual screening

2. Portfolio categorization
   - KMX classifiers were employed to categorize the client’s portfolio
   - The technical category having the highest KMX score corresponding to a particular patent was considered relevant for that patent.

Client’s patent portfolio for categorization

Repository of KMX classifiers corresponding to various technical categories.
Case Study 1 – Portfolio Categorization
Achieved 90% Time savings with Machine approach

Steps:
“Machine” steps -
• Use already manually categorized patents to create KMX classifiers
• Test each classifier with sample set of patents to fine-tune classifiers.
• Use KMX classifier to assign ‘score’ to each patent to obtain automated categorization

Benefit:
• 90% reduced cost for client
• Achieved 70% accuracy

Productivity

Quality
Case Study 2 – Proactive Patent Defence
Identifying defensive patents against companies posing threat

Context >

Organization
Multinational technology corporation

Industry
Internet, Web services

Function (s)
Due Diligence

Geography
HQ in US

Business Challenge >

• Client wants to be quickly ready with defensive list of patents against companies posing threat to them
• Client wants to identify list of patent from their own portfolio which can be relevant to features of products from company posing threat

Solution >

Evalueserve Team
Sorted List of patents based on KMX classifier
Detailed product search on high scoring patents
EoU chart

Client Teams
Sorted list of portfolio based on relevancy to a product feature
Short list of potential patents for a product feature
Defensive EoU charts

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Case Study 2 – Proactive Patent Defence
Reduced 35% effort to find a set of relevant patents

Steps:
“Machine” steps -
• Identify training set for KMX classifier based on known patents relevant for a product feature
• Use various parameter weight setting to identify optimal setting based on KMX landscape
• Identify negative training set from KMX landscape
• Build KMX classifier using the training set and run it on companies own portfolio

“Mind” step, done by client himself -
• Analyze top patents from KMX classifier

Benefit >

Productivity
• 35% reduced effort of client

Quality
• Client obtained a sufficient number of patents for the defensive list from relevant patents identified using KMX

Client obtained a sufficient number of patents in both projects

Approach >
Key takeaways

• Automated classification is used on a regular basis by Evalueserve
  • To improve accuracy: mind + machine approach
  • To increase efficiency: machine-only approach

• Proven use cases:
  – It can be used for:
    – Filtering relevant documents out of a broad result set (comparable to pre-classification)
    – Tagging documents to a hierarchical label tree (comparable to reclassification)

• Case examples
  – Automated classification can lead to clear efficiency gains
    – Portfolio Categorization use case:
      – Efficiency gain: 90%
      – Accuracy: 70%
    – Proactive Patent Defense use case:
      – Efficiency gain 30%
      – Accuracy: 100%*

*Client obtained sufficient number of relevant patents
Thank you!

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Recommended read: mind+machine
a decision model for optimizing and implementing analytics

By Evaluseserve Co-Founder, Chief Strategist Marc Vollenweider

Decision-makers are reliant on receiving the necessary insight at the right time in a suitable format.

The marriage of the perceptive power of the human brain with the benefits of cutting edge machines is essential because neither mind nor machine can handle the complexities of modern analytics on their own.

Only when the two come together with structure and purpose to solve a problem are goals achieved.

This book by Marc Vollenweider covers the entire end to-end value chain of analytics.

Mind+Machine: A Decision Model for Optimizing and Implementing Analytics
by Marc Vollenweider
Link: http://a.co/1eZyrBs
Appendix – Mind+Machine use cases
Case Study 3 – Managing bi-annually portfolio updates
Implementing Mind+Machine for identification of domain of patent documents

Context >

Organization
Multinational Conglomerate

Industry
Electric, Aviation, Healthcare, Oil and Gas

Function (s)
IP Strategy

Geography
HQ in US

Business Challenge >

- Client required budget/quick landscape study in which patents are categorized in select technology domains
- Due to large number of published patents (bi-annually (~20k)) and technology specific portfolio, client was facing challenge in doing analysis in low budget

Solution >

1. Data Input
   - Categorized patent document repository

2. Portfolio Assessment
   - Mind + Machine Approach
     - KMX Classifiers created
     - Modified the input of KMX based on technologies (using classes, assignees)
     - Identification of threshold & use the classifiers in specific sequence

3. Data Input
   - Uncategorized patent documents

4. Portfolio Analysis
   - Run prepared KMX Classifiers
   - Manually categorizing patents which are not falling under defined threshold range

Share it with Client
Case Study 3 – Managing bi-annually portfolio updates
Achieved 90% accuracy with Mind+Machine approach, with time savings

Steps:

“Machine” steps -
• Use already manually categorized patents to create KMX binary classifiers
• Test each classifier with sample set of patents.

“Machine+Mind operator” step -
• For every classifier, identify and club/remove overlapping & not relevant technologies with help of assignees, classes and keyword based search string. This means modifying the input of KMX.

“Machine” step -
• Use KMX classifier to assign ‘score’ to each newly published patent to obtain automated categorization

“Mind” step -
• Manually categorize patents which were not categorized using KMX because they were falling under defined threshold range

--Approach--

Benefit >

Productivity
• 66% reduced effort of client

Quality
• Achieved 90% accuracy

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Reduction of Man hours vs Accuracy

<table>
<thead>
<tr>
<th>Project</th>
<th>Reduction in Man hours (%)</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1: Mind ony</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Project 2: Mind+Machine+Mind operators</td>
<td>66</td>
<td>90</td>
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</table>

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Case Study 4 – Competitive Benchmarking
Implementing Mind+Machine for quick benchmarking study

**Context >**

- **Organization**
  - Forest Industry Company

- **Industry**
  - Pulp, Paper and Timber

- **Function (s)**
  - R&D Strategy

- **Geography**
  - HQ in Europe

**Business Challenge >**

- Client wanted to perform a quick competitive benchmark of its own portfolio with their competitor’s, in select technical categories
- Client did not want 100% accuracy, but had limited budget for the study

**Solution >**

- Client’s Categorized portfolio
- Competitor portfolios
- Training set for KMX
- Sampling + Manual validations & corrections
- KMX Classified Patents

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Case Study 4 – Competitive Benchmarking
Reduced 80% cost for client, while providing 70% accuracy

**Steps:**

**“Machine” steps -**
- Identify patents assigned to client and its competitors for last 5 years
- Use existing client’s categorized patents to prepare KMX classifiers
- Categorization using KMX classifiers was done for ~40,000 extracted patents

**“Mind” step:**
- 4 iterations of manual checking of ~4,000 patents were performed to further tune KMX classifiers

**“Machine” step:**
- Modified KMX classifiers were run on entire set of 40K patents

**Benefit:**

**Productivity**
- 80% reduced cost for client

**Quality**
- Ensured 70% accuracy – which was minimum expected from client

**Approach >**

**Reduction of Man hours vs accuracy**

<table>
<thead>
<tr>
<th>Project 1: Mind only</th>
<th>Project 2: Machine only</th>
<th>Project 3: Mind+Machine</th>
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</thead>
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<tr>
<td>Reduction in Man hours (%)</td>
<td>Accuracy</td>
<td></td>
</tr>
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<td>80</td>
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<td>35</td>
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Case Study 5 – Extra review step in R&D alerts
Implementing Mind+Machine for R&D Alerts

**Context >**

**Organization**
Multinational Chemical Company

**Industry**
Chemical and construction

**Function (s)**
R&D Alerts

**Geography**
HQ in Europe

**Business Challenge >**

- Client maintained monthly R&D alerts, in which experts identified relevant new patents and applications in key technical domains.
- Client wanted to increase accuracy by adding an extra review step, without drastically increasing costs.

**Solution >**

- Labeled training set (based on previous R&D alerts)
- Potentially relevant patents
- Expert inspects and filters
- Expert reviews discrepancies
- Relevant Patents
Case Study 5 – Extra review step in R&D alerts
Increased accuracy by 3% using Mind+Machine approach

**Steps:**

**“Machine” steps -**

- One-time setup:
  - Classifier is trained using previous R&D alert results

- Monthly steps:
  - **“Mind” step:**
    - Expert labels incoming patents
  - **“Machine” step:**
    - KMX labels incoming patents
  - **“Mind” step:**
    - Expert reviews patents for which no consensus was reached

**Benefit:**

- **Productivity**
  - 43% increased efficiency compared to workflow with an independent expert review

- **Quality**
  - Increased accuracy from 95% to 98%

![Accuracy Graph]

Accuracy%:
- Project 1: Mind only
- Project 2: Mind + Machine
<table>
<thead>
<tr>
<th>Case Study</th>
<th>Case study</th>
<th>Mind+Machine</th>
<th>Accuracy</th>
<th>Efficiency gain</th>
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<tbody>
<tr>
<td>Case Study 1 – Portfolio Categorization</td>
<td>Machine only</td>
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<td>90%</td>
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<tr>
<td>Case Study 2 – Proactive Patent Defence</td>
<td>Machine only</td>
<td>100%*</td>
<td>35%</td>
<td></td>
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<tr>
<td>Case Study 3 – Managing bi-annually portfolio updates</td>
<td>Mind+Machine</td>
<td>90%</td>
<td>66%</td>
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<tr>
<td>Case Study 4 – Competitive Benchmarking</td>
<td>Mind+Machine</td>
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<td>80%</td>
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<td>Case Study 5 – Extra review step in R&amp;D alerts</td>
<td>Mind+Machine</td>
<td>98%</td>
<td>43%</td>
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</tbody>
</table>

*Client obtained sufficient number of relevant patents*