A Unsupervised Information Extraction with the ONDUX Tool

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Presented by André Porto

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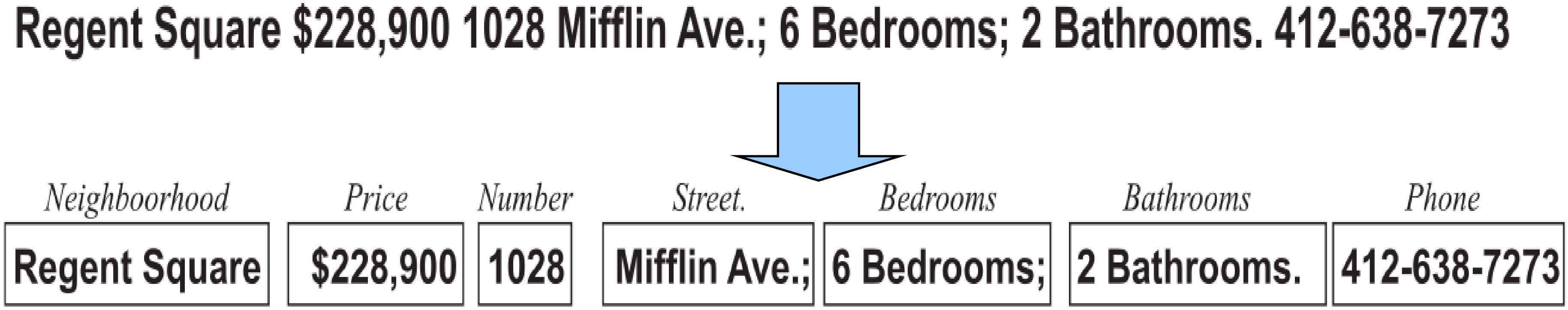
The IETS Problem

- **Information Extraction by Text Segmentation**
- Goal:
  - To extract attribute values occurring in implicit semi-structured data records
- Current IETS methods predict labels for sequence of text segments corresponding to attribute values
  - HMM – Borkar et al. (SIGMOD01), CRF – Laferty et al. (ICML01), ONDUX – Cortez et. al (SIGMOD10)



Regent Square $228,900 1028 Mifflin Ave.; 6 Bedrooms; 2 Bathrooms. 412-638-7273

Neighboorhood	*Price*	*Number*	*Street.*	*Bedrooms*	*Bathrooms*	*Phone*
Regent Square	$228,900	1028	Mifflin Ave.;	6 Bedrooms;	2 Bathrooms.	412-638-7273

Motivation

- Abundance of on-line sources of text documents
  - Postal Addresses, Classified Ads, Bibliography references...
- Necessity of storing these data in structured format
  - Relational DB, XML,
- Unsupervised Methods rely on attribute values from pre-existing data sources to perform extraction task
  - Knowledge Bases

Examples

Product Descriptions

Apple iPad 2 Wi-Fi + 3G 64 GB - Apple iOS 4 1 GHz - Black $589

LG - 32LE5300 - 32" LED-backlit LCD TV - 1080p (FullHD) - $400

Samsung - UN55D7000 - 55" Class (54.6" viewable) LED-backlit LCD ... $2,048

Mixter Max Accessory Plasma TV Rack Tilt Bracket 248-A05 $65

HP Deskjet 3050 All-in-One Color Ink-jet - Printer / copier / scanner $50

Bibliographic Citations

L. Barbosa and J. Freire. Using Latent-structure to Detect … In Proc. of the 13th WeDB, pages 1–6, 2010.

A. Doan et. al. Information Extraction Challenges in Managing .. SIGMOD Record, 37(4):14–20, 2008.

J. Pearl and G. Shafer. Probabilistic reasoning in intelligent systems: Morgan Kaufmann, 1988.

Classified Ads

$1106 / 2br - Luxury 2 BR, 1 BA apartment loaded with amenities - (Bothell)

$1945 / 2br - Beautiful HighPoint Community "Built Green" 2 BR 2.5 Bth Town Home! - (West Seattle)

$735 / 1br - Top floor 1 bedroom apt available just minutes from downtown!! - (Seattle,Burien,Highline)

$820 / 1br - Lovely 1 bedroom 1k sq ft! Nearly a 2 bdrm! - (Federal Way,Edgewood,Milton,Tacoma)

$895 / 2br - ****Lovely 2-Bedroom/2-Bathroom Condo with a View! FREE RENT!!!**** - (Monroe)

Related Work – IETS Approaches/Methods

- Probabilistic – Supervised
  - Hidden Markov Models (HMM)
    - Borkar et al.@SIGMOD'01;McCallum et al.@AAAI'00
  - Conditional Random Fields (CRF)
    - Lafferty et al.@ICML'01;McCallum et al.@IPM'06)

- Require labeled training instances

<Neighboorhood>Regent Square </Neighboorhood> <Price> $228,900 </Price>
<No>1028 </No><Street>Mifflin Ave, </Street> <Bed>6 Bedrooms </Bed>
<Bath> 2 Bathrooms </Bath> <Phone>412-638-7273 </Phone>

Related Work - IETS Approaches / Methods

- Probabilistic – Unsupervised
  - Rely on previously built datasets
  - Unsup. HMM (Agichtein et al.@SIGKDD '04)
    - Rely on records in references tables
    - Still requires a few training instances
  - Unsup. CRF (Zhao et al. @SIAM ICDM'08)
    - Also reference tables
    - Batches of fixed-order records as input
  - ONDUX (Cortez et al. @SIGMOD'10)
    - Knowledge-base: sets of typical values per attribute – no records

Tool Overview

- Implements an information extraction method called ONDUX (On-Demand Unsupervised Information Extraction) [E. Cortez et. al. 2010] for extracting information from unstructured data records.

- Should allow:
  - Easy to Use
  - Use by final users
  - Conducting experiments with ONDUX
  - Support the teaching of extraction techniques

Tool Overview

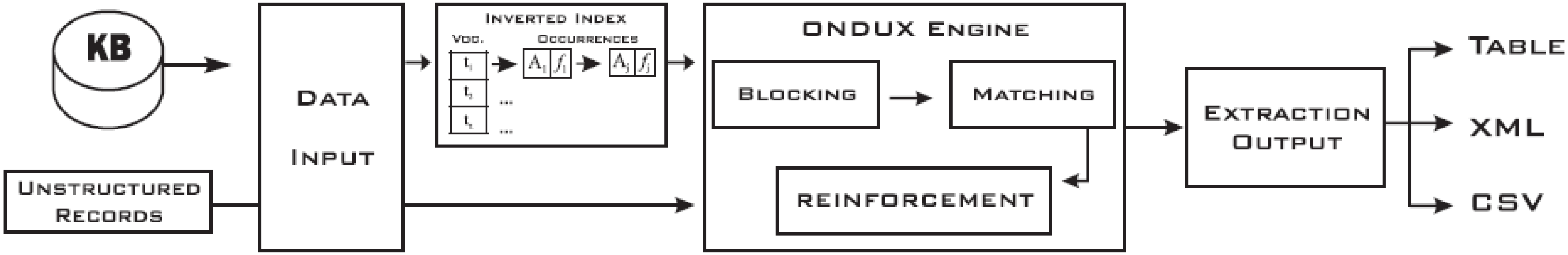
- An effective implementation of an unsupervised probabilistic approach for information extraction by text segmentation;

- A friendly graphical user interface that allows non expert users to easily carry out information extraction tasks;

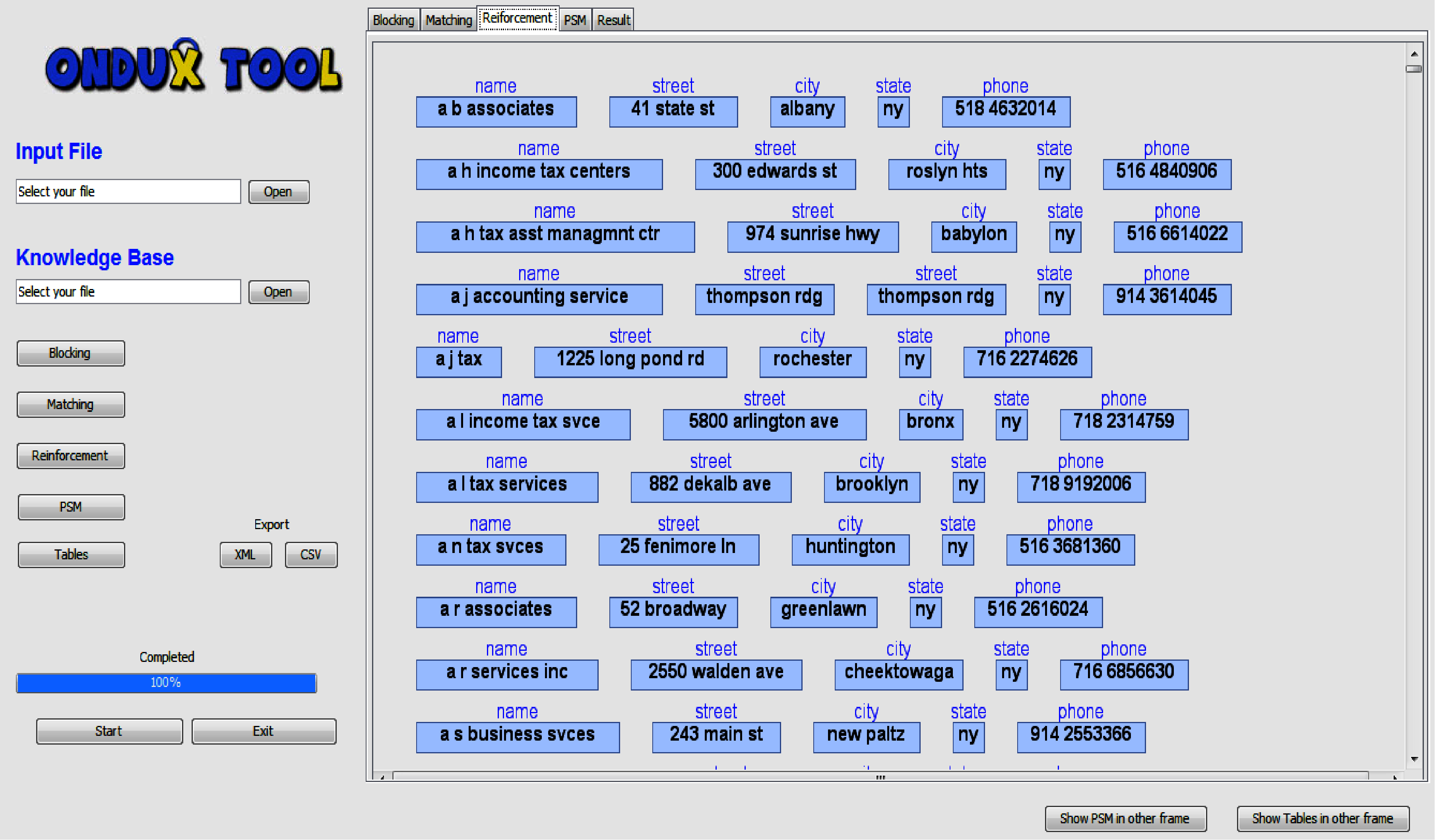
- Visualization facilities that allow users to follow a understand all the steps involved in the extraction process.

Tool Overview

- Architecture
  - Data Input: handles the KB and the input file
  - ONDUX Engine: implements the 3 main steps of the ONDUX method:| Blocking, Matching and Reinforcement
  - Extraction Output: presents the extraction results to the user and exports it to several formats



Ondux Tool



Input File

Select your file

Knowledge Base

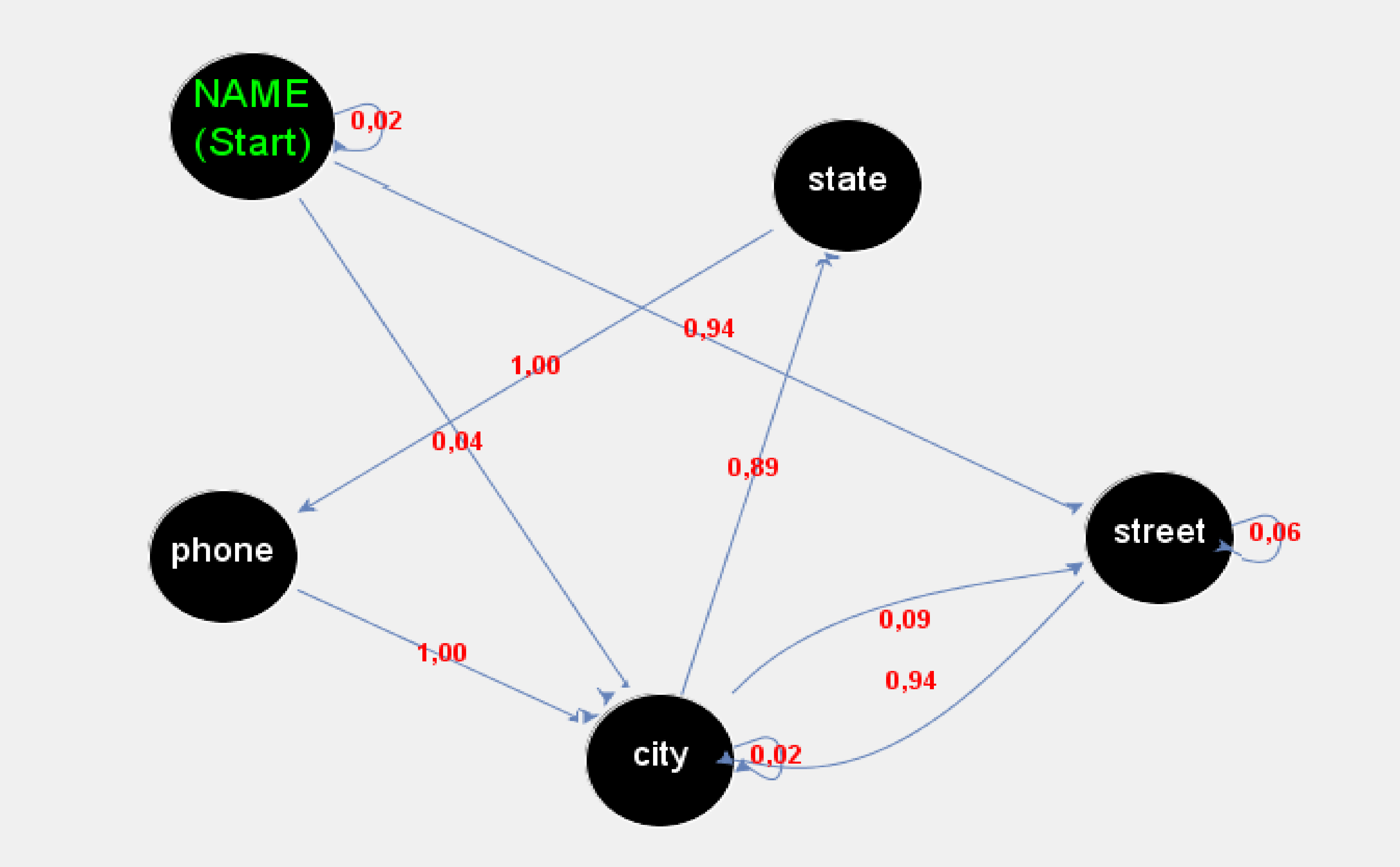
Select your file

Completed

100%

name	street	city	state	phone
a b associates	41 state st	albany	ny	518 4632014
name	street	city	state	phone
a h income tax centers	300 edwards st	roslyn hts	ny	516 4840906
name	street	city	state	phone
a h tax asst managmnt ctr	974 sunrise hwy	babylon	ny	516 6614022
name	street	street	state	phone
a j accounting service	thompson rdg	thompson rdg	ny	914 3614045
name	street	city	state	phone
a j tax	1225 long pond rd	rochester	ny	716 2274626
name	street	city	state	phone
a l income tax svce	5800 arlington ave	bronx	ny	718 2314759
name	street	city	state	phone
a l tax services	882 dekalb ave	brooklyn	ny	718 9192006
name	street	city	state	phone
a n tax svces	25 fenimore ln	huntington	ny	516 3681360
name	street	city	state	phone
a r associates	52 broadway	greenlawn	ny	516 2616024
name	street	city	state	phone
a r services inc	2550 walden ave	cheektowaga	ny	716 6856630
name	street	city	state	phone
a s business svces	243 main st	new paltz	ny	914 2553366

PSM Graph


NAME
(Start)
0,02
state
0,94
1,00
0,04
0,89
phone
street
0,06
0,09
1,00
0,94
city
0,02

Tool Functions

- Blocking
  - Segments the input string into **blocks**
- Matching
  - Matches blocks against known attribute values in the KB
  - From the best match, a label is derived
- Reinforcement
  - Relabel mismatched and umatched blocks
- PSM
  - Show PSM Graph
- Export Data
  - XML and CSV

Experiments

Domain	Dataset	Text Inputs	Attributes	Source	Attributes	Records
Cooking Recipes	Recipes	500	3	FreeBase.com	3	100
Product Offers	Products	10000	3	Nhemu.com	3	5000
Postal Adresses	Big Book	2000	5	BigBook	5	2000
Bibliography	CORA	500	3 to 7	PersonalBib	7	395
Classified Ads	WebAds	500	5 to 18	Folha On-line	18	125

- Datasets: Used for test
- Source: Used for building each KB

Conclusions

- In this demo we presented a tool that implements ONDUX

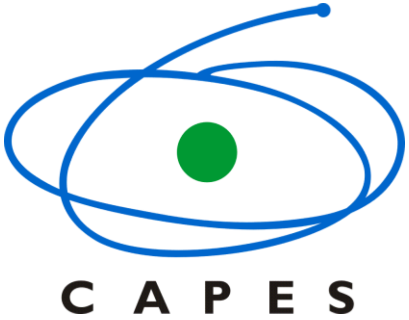
- The ONDUX Tool allows non expert users to easily perform information extraction tasks and export the extraction result in different formats.

- Can be used as a teaching tool

Acknowledgments

UNIVERSIDADE FEDERAL DO AMAZONAS
IN UNIVERSA SCIENTIA VERITAS
UFAM

CNPq
Conselho Nacional de Desenvolvimento Científico e Tecnológico
60 ANOS



Thank you!

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