

# CriPA

## Crime Predictive Analysis

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# Research Project Crime Predictive Analytics (CriPA)

■  **KIRAS** Security Research Project  
Sicherheitsforschung  
October 2013 – July 2015



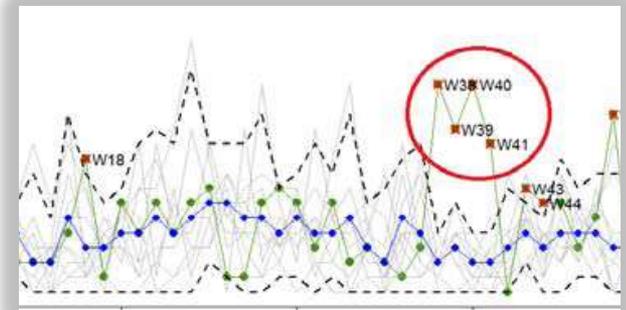
## ■ Partners

- Joanneum Research
- Criminal Intelligence Service Austria
- University of Salzburg - Z\_GIS
- SynerGIS Informationssysteme
- Institute of the Sociology of Law and Criminology



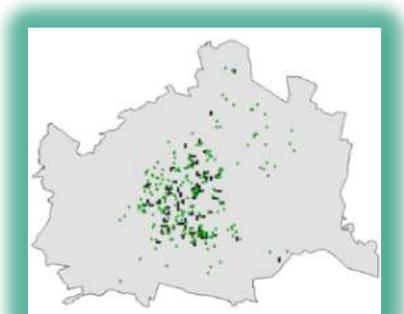
## CriPA – Predictive Crime Analytics

- Research on quantitative methods on pattern detection and relationships in crime data to forecast future crime
- Models for mid- to long-term prognoses on a small-scale to estimate trends in future crime
  - Spatial regression models using variables such as demography, land use, infrastructure, events, weather, ...

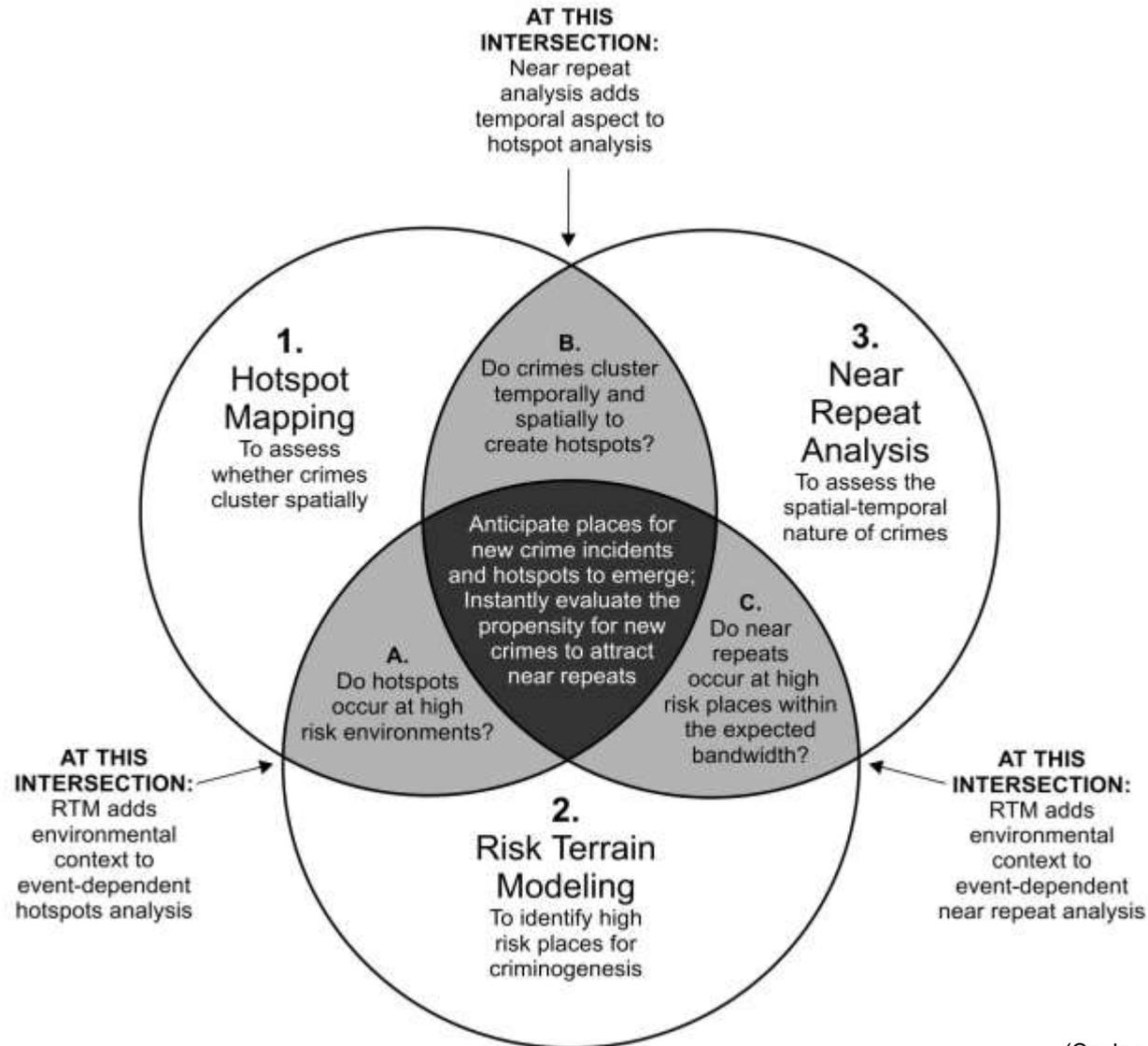


## CriPA – Predictive Crime Analytics

- Methods for short term predictions on a large scale
  - Space-time regression models
  - Spatio-temporal analyses (hot spot mapping, near repeat victimization, risk terrain modeling)
- Integration of data mining tools to enhance the quality of predictions
- Aims
  - Focused combating of crime
  - Optimal allocation of law enforcement resources

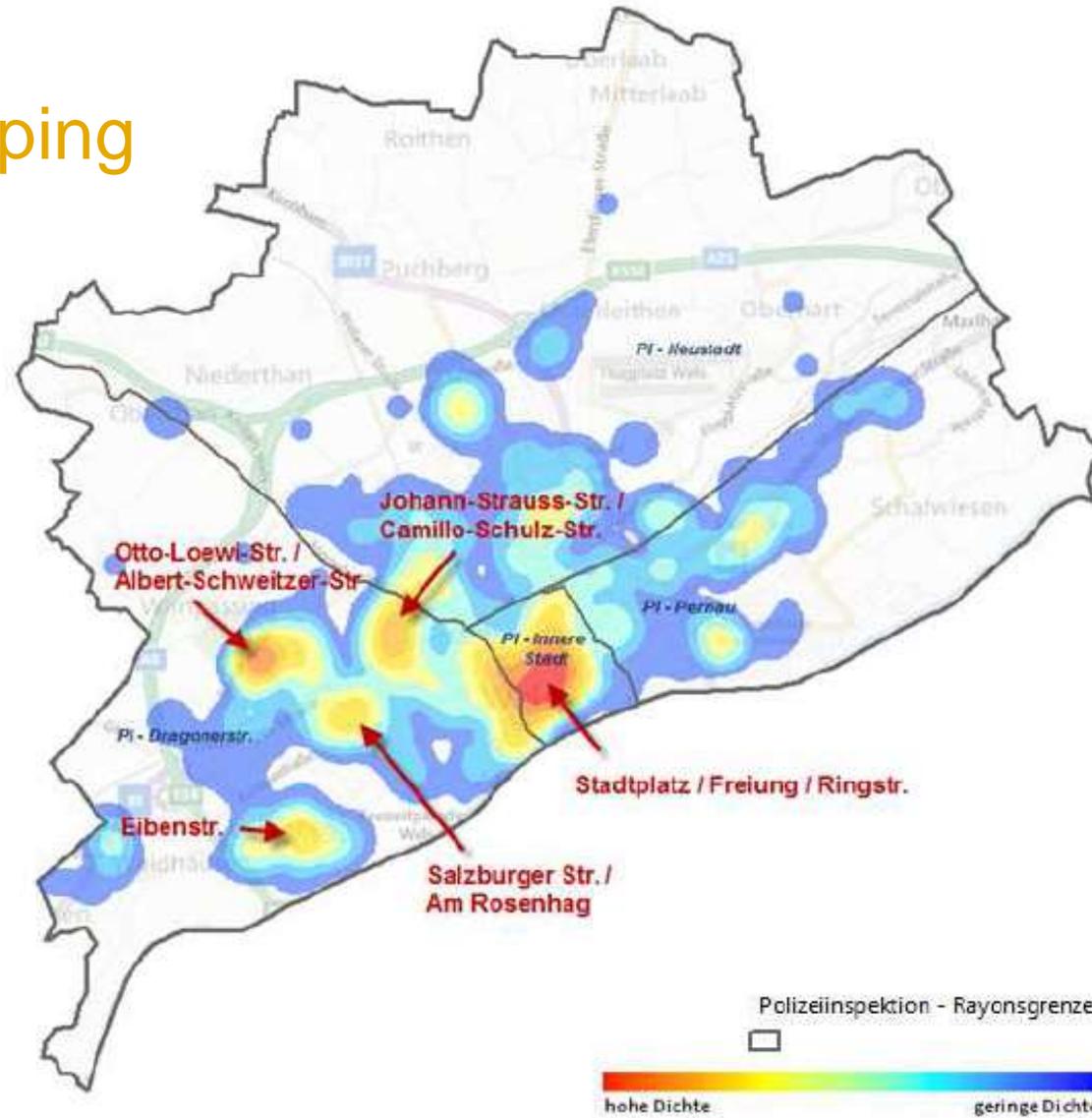


➔ **GIS-based application**

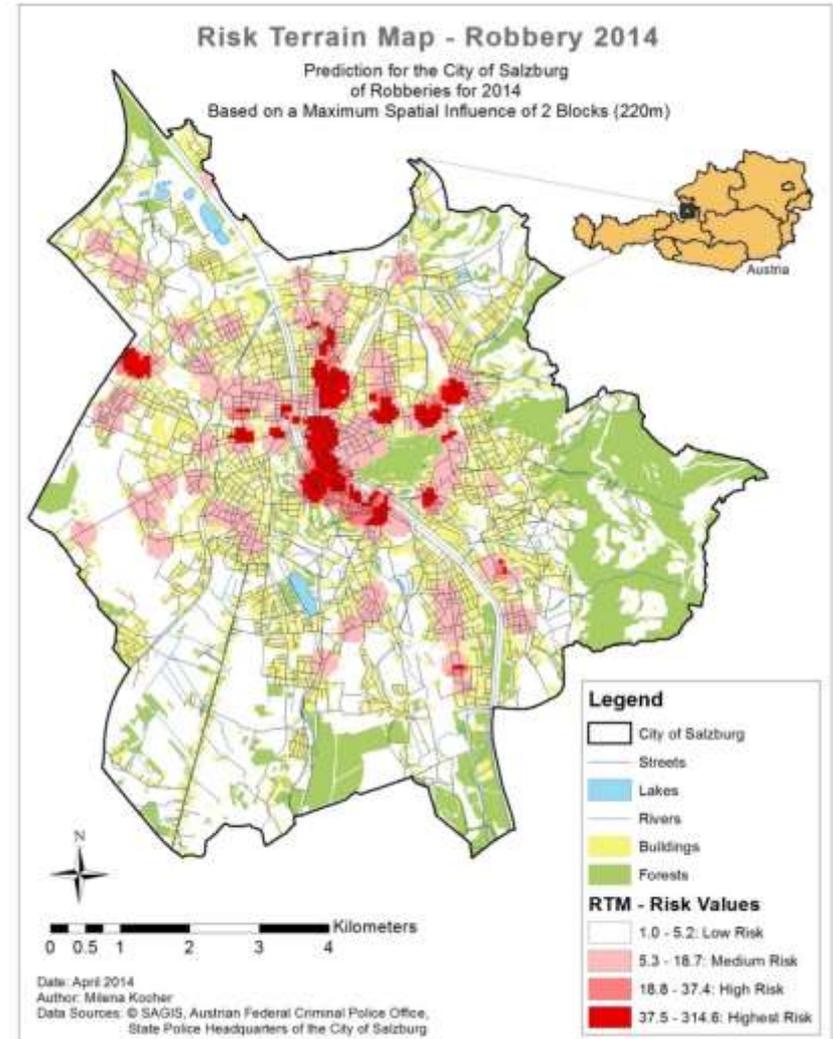
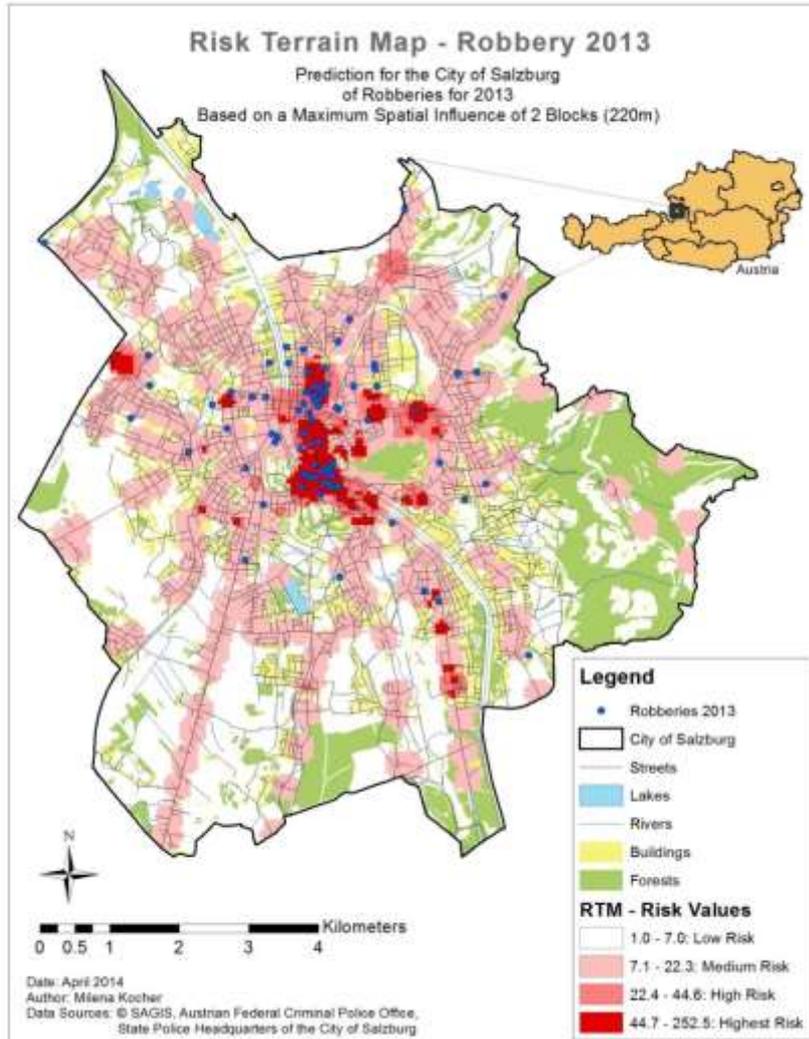


(Caplan, Kennedy, and Piza 2013)

# Hotspot Mapping

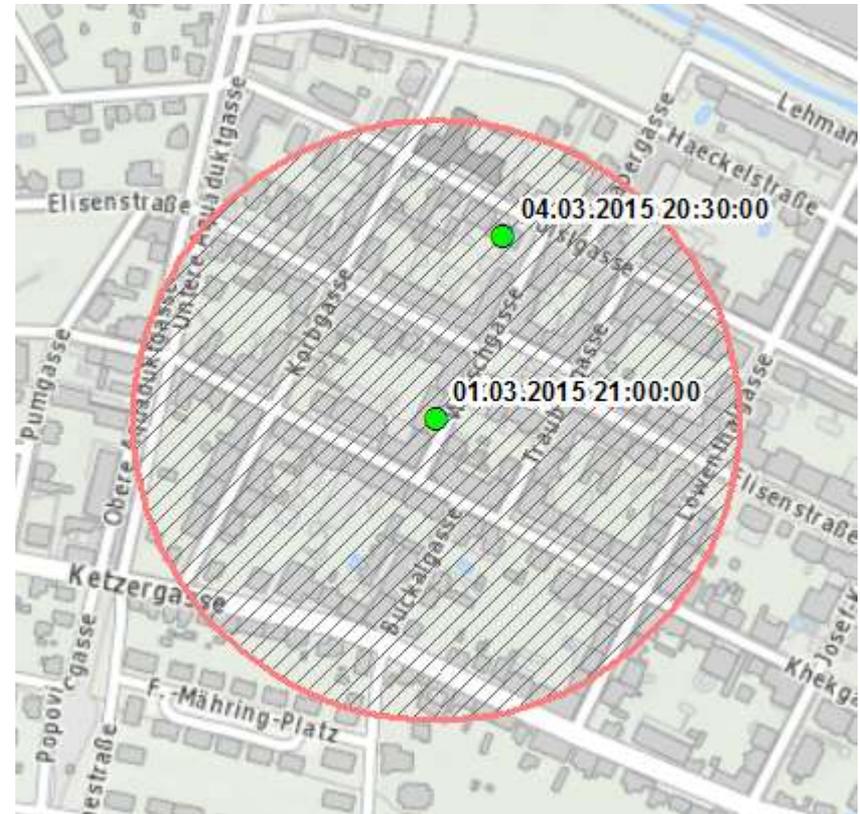


# Risk Terrain Modelling



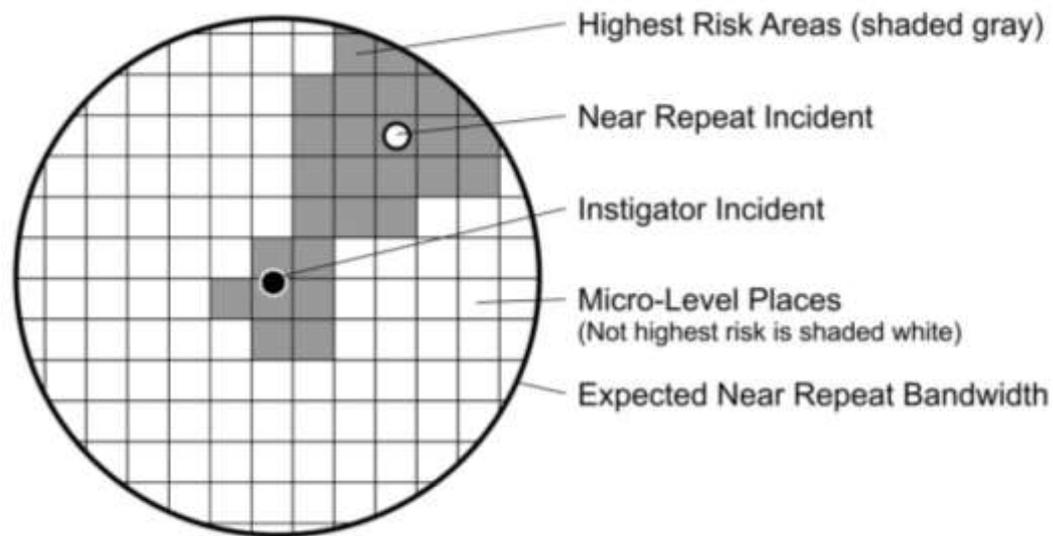
## Near Repeat Victimization

- After a previous crime event, nearby targets have an increased risk of victimization for a short period of time
- This way, the focus lies on **serial offenders**
- 70% of residential burglaries within 500m and 7 days  
Vienna, 2009-2013



## Combining approaches

- Capitalize on unique strengths of each method



(Caplan, Kennedy, and Piza 2013)

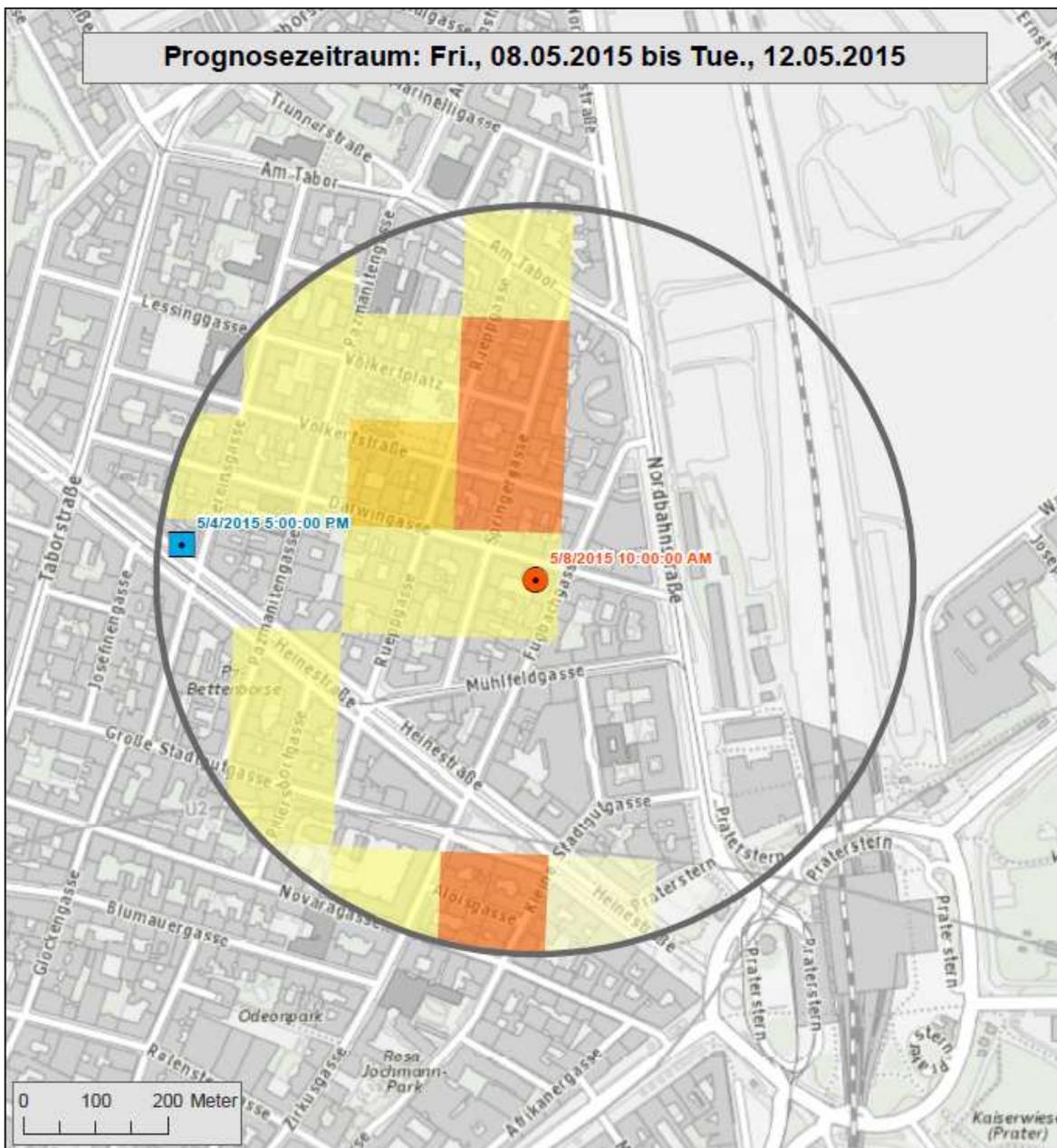
## Methodical background of CriPA

- Using historical residential burglaries, predictions for future residential burglaries are calculated
- Based on **Near Repeat Victimization**
  - After a previous crime event, nearby targets have an increased risk of victimization for a short period of time
  - This way, the focus lies on **serial offenders**
- Comparison of properties of this event-pair
  - e.g., modus operandi, stolen goods, time of day,...
- Visualizing **risks for future residential burglaries**

## Space-time estimation of risk

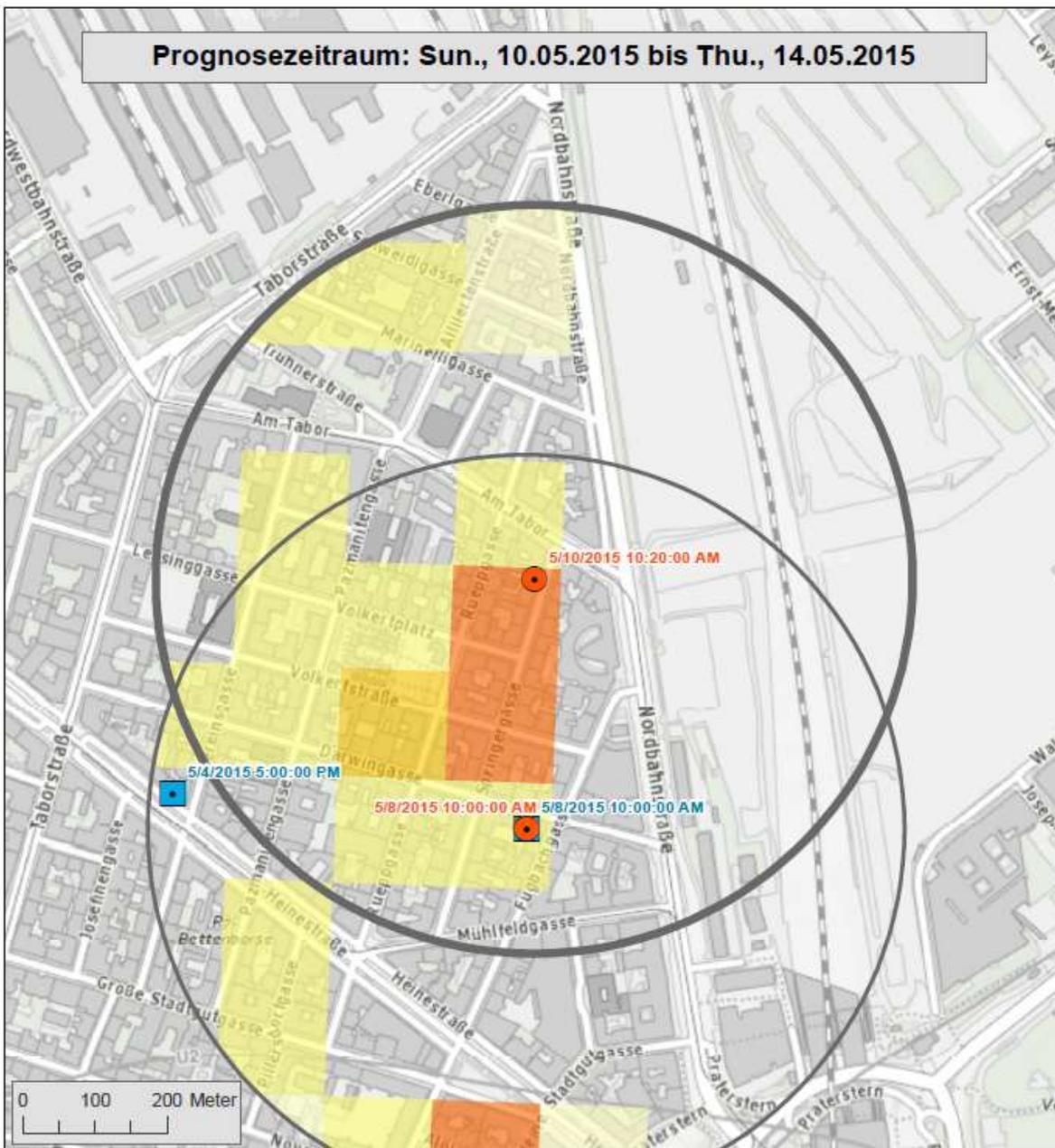
- Modeling space-time risks on a regular raster
  - Modeling the probability for a future crime event to occur in a raster cell at a specific time
  - Consideration of timely information of historical crime events
  - Consideration of criminogenic risk factors
    - Demographic properties (population, family status, income,...)
    - Distance to Points of Interests (schools, major roads, nightlife,...)
  - Consideration of spatial effects (neighborhood effects)
  - **Aim:** Estimating probabilities of future crime events to occur

Prognosezeitraum: Fri., 08.05.2015 bis Tue., 12.05.2015



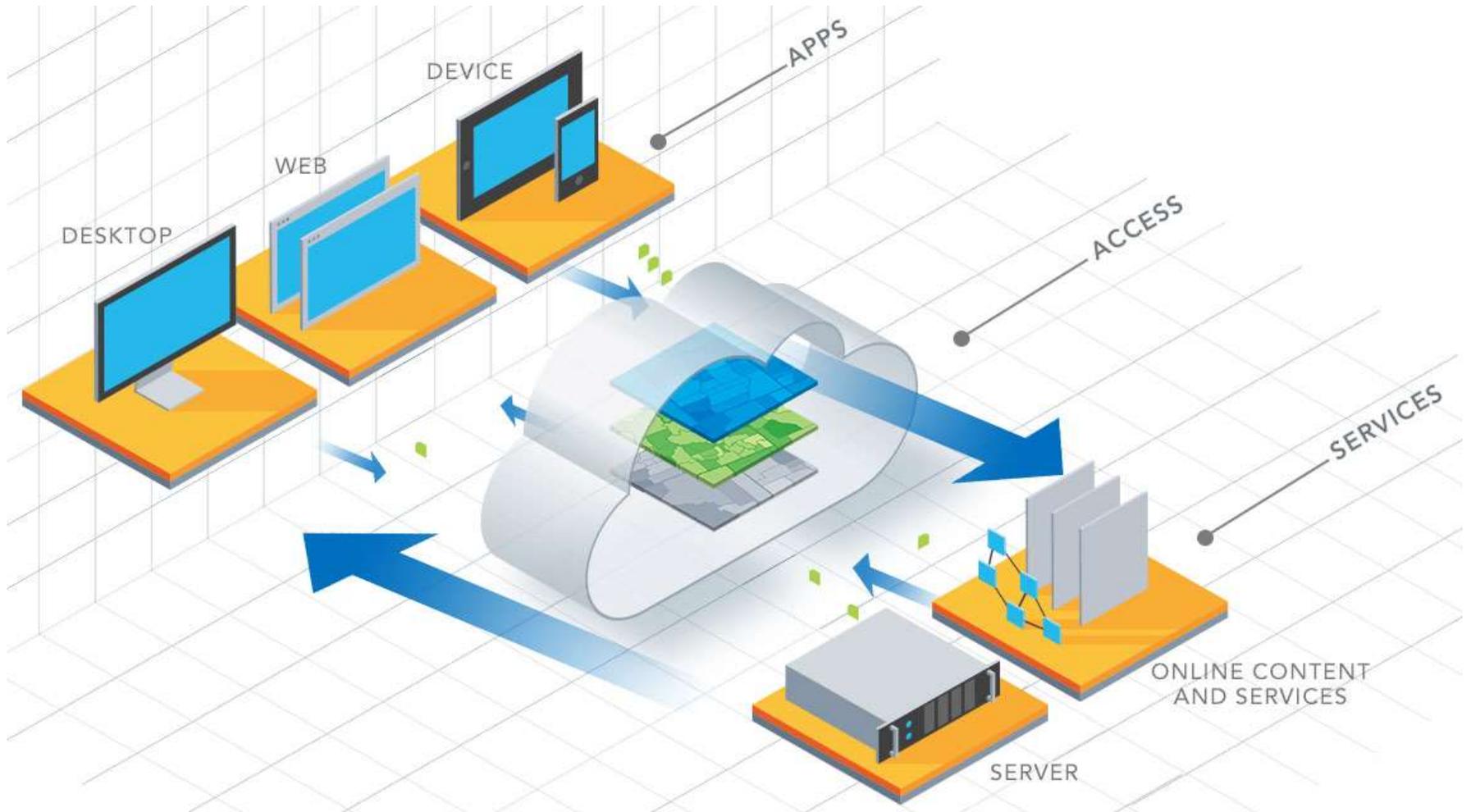
|  |   |
|--|---|
| <b>Originator (1/1)</b>                              | <b>Near Repeat</b>  |
| 7217188  | 7223433   |
| D1/143570/2015/15001                                 | D1/149066/2015/15001  |
| Mon., 04.05.2015 07:00 bis<br>Mon., 04.05.2015 17:00 | Fri., 08.05.2015 08:30 bis<br>Fri., 08.05.2015 10:00  |
| 1020, Heinestraße 9                                  | 1020, Darwingasse 32  |
| Kein Gut   | Laptop/Notebook/Tablet,<br>Elektronikgeraete Sonstiges,<br>Sonstiges Gut,   |
| <b>AUFBRECHEN (TUER)</b>                             | <b>AUFBRECHEN (TUER)</b>  |
| Versuch: ja - Geklaert: nein                         | Versuch: nein - Geklaert: nein  |
| Spuren: -  | Spuren: D, D, D, D, D   |
| Wohnungstür.   | WHG ED durch das Abdrehen des<br>Schlosszylinders. Keine Zeugen oder<br>Auskunftspersonen.  |
| Wohnung, Versuch                                     | WHG-ED  |
| kein Gut   | Laptop / Notebook / Tablet, PCs und<br>Zubehör, Laptop ACER schwarz,<br>Foto- Filmgeräte, CANON powershot<br>silber, Bargeldbestände, Schmuck<br>sonstiger, diverser<br>Familiengoldschmuck |
|  |   |
|  |   |

Prognosezeitraum: Sun., 10.05.2015 bis Thu., 14.05.2015



| Originator (1/1)  | Near Repeat  |
|---|--|
| 7223433   | 7225983  |
| D1/149066/2015/15001  | D1/150284/2015/15001   |
| Fri., 08.05.2015 08:30 bis<br>Fri., 08.05.2015 10:00  | Fri., 08.05.2015 10:00 bis<br>Sun., 10.05.2015 10:20         |
| 1020, Darwingasse 32  | 1020, Springergasse 29                                       |
| Laptop/Notebook/Tablet,<br>Elektronikgeraete Sonstiges,<br><b>SONSTIGES GUT,</b>  | <b>SONSTIGES GUT, Inventar</b>                               |
| Aufbrechen (Tuer)   | Aufbrechen (Fenster)   |
| Versuch: nein - Geklaert: nein  | Versuch: nein - Geklaert: nein                               |
| Spuren: D, D, D, D, D   | Spuren: D, S, W  |
| WHG ED durch das Abdrehen des<br>Schlosszylinders. Keine Zeugen oder<br>Auskunftspersonen.  | Einbruchsdiebstahl in Wohnung durch<br>unbek. Täter          |
| WHG-ED  | Wohnung  |
| Laptop / Notebook / Tablet, PCs und<br>Zubehör, Laptop ACER schwarz,<br>Foto- Filmgeräte, CANON powershot<br>silber, Bargeldbestände, Schmuck<br>sonstiger, diverser<br>Familiengoldschmuck | sonstiges Gut, Silberbesteck,<br>Besteck, Material 1: Silber |
|   |  |
|   |  |

# ArcGIS platform





Esri Official Distributor:

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