Discovering Automated Sequential Patterns that Precede Outbreaks of Socio-Political Violence

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Primary Topic Area: Socio-cultural modeling in support of intelligence analysis
Secondary Topic Area: Understanding human behavior

The integration of emerging HSCB modeling technologies has enabled a paradigm shift in warfighters' abilities to understand and anticipate outbreaks of socio-political violence. We introduce one such emerging HSCB modeling technology – the sequential pattern methodology. We have applied the sequential pattern methodology to automatically identify patterns of observed behavior that precede outbreaks of socio-political violence such as riots, rebellions and coups in nation-states. This anticipatory ability provided by the sequential pattern technology enables both socio-cultural modeling in support of intelligence analysis and a data-driven understanding human behavior that can be used to forecast the future outbreak of socio-political violence.

The sequential pattern methodology is a groundbreaking approach to HSCB pattern discovery because it generates easily interpretable patterns based on direct observations of sampled factor data for a deeper understanding of societal behaviors. The sequential pattern methodology defines patterns as identifications of observed commonalities preceding multiple outbreaks of similar types of socio-political violence, but not before non-outbreaks. Later observations of these commonalities indicate that the discovered pattern may be present and leads to forecasts of socio-political violence.

The sequential pattern methodology provides a novel, easy to interpret and highly customizable architecture for socio-cultural modeling and decision support. Discovered sequential patterns permit a clear audit trail to guide the diagnostic replication of discovered patterns and observed behaviors. We have applied our sequential pattern methodology to retrospectively mine large temporal datasets collected from our automated data collection processes and aggregated by Semantic Web technologies.