

To the Press

May 30, 2024  
Geotechnologies, Inc.

## **GeoTechnologies Develops Intersection Risk Estimation Model Based on People Flow Data**

AI calculates the risk of traffic accidents at daily accessible intersections and makes it possible to ascertain the risk level.

GeoTechnologies, Inc. (headquartered in Bunkyo-ku, Tokyo; Hiroshige Sugihara, Chairman and Representative Director; Yoichiro Yatsurugi, President and CEO; hereinafter “GeoTechnologies”), an ESG metaverse company, has successfully developed an intersection risk estimation model that calculates accident risk at familiar intersections such as those in residential areas by combining our people flow data with AI technology.

With this development, it is now possible to calculate accident risks at small intersections consisting of residential roads, which have been considered difficult to calculate in the past. This makes it possible to identify in advance dangerous intersections hidden in daily accessible roads that people usually use for commuting to work or school.

By identifying dangerous intersections, the system can be expected to contribute to accident prevention efforts, such as presenting safer transportation routes that avoid the intersections in question, alerting drivers and residents in the vicinity, and improving road maintenance to enhance safety and security.

### ■ Social Background of Development

According to statistics from the Ministry of Land, Infrastructure, Transport and Tourism, the number of traffic fatalities in Japan has been steadily decreasing since 1995\*, reaching a record low of 2,610 in 2022. On the other hand, the decrease in the number of traffic accidents on residential roads has been very small, with one out of every four accidents occurring on major roads in 2022. Therefore, the most important issue for further reduction of traffic accidents in the future is how to reduce the number of traffic accidents on roads used for daily life.

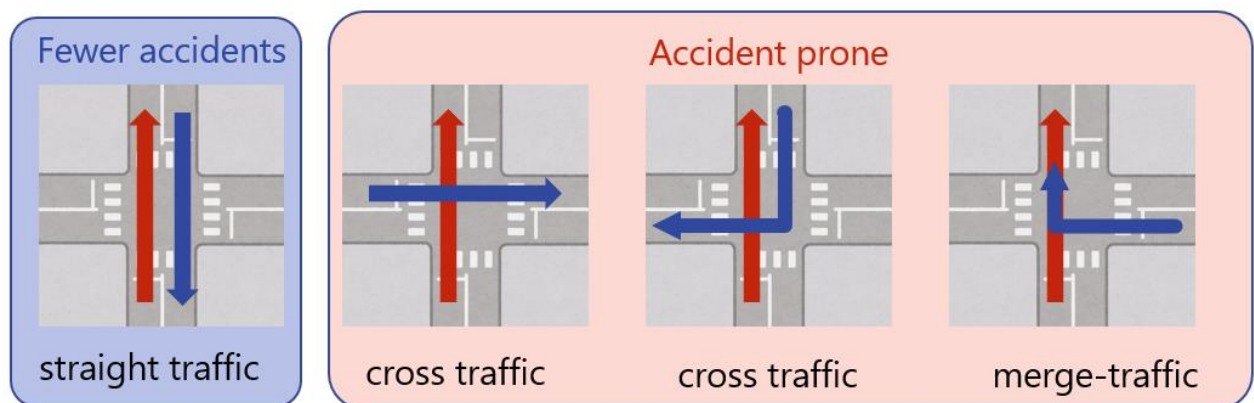
\*Ministry of Land, Infrastructure, Transport and Tourism, Traffic Accidents

<https://www.mlit.go.jp/road/road/traffic/sesaku/jiko.html>

### ■ Features of the Intersection Risk Estimation Model

The most distinctive feature of the intersection risk estimation model we have developed is that it identifies traffic patterns (straight, right and left turns) at intersections by generating all users' traffic trajectories based on human flow data, and incorporates cross-traffic and merge-traffic as risk estimation factors.

For example, straight traffic facing each other is unlikely to come into contact with each other as shown in the blue figure, while cross traffic and merge traffic may come into contact with each other as shown in the red figure. Thus, by incorporating the estimation factors of cross-traffic and merge-traffic, we can make more effective estimation than by simply estimating traffic volume.



Since our people flow data includes information not only on vehicles but also on pedestrians, it is possible to create pedestrian-specific traffic trajectories. By utilizing the characteristics of pedestrians, it is possible to estimate the risk of accidents between vehicles and pedestrians, in addition to estimating the risk of accidents between vehicles.

## ■ Outline of Research and Development

Based on the characteristics of each intersection, such as the volume of vehicle and pedestrian traffic and the structure of the intersection, taking into account traffic patterns calculated from our human flow data, and using traffic accident information\* published by the National Police Agency as the correct data, we created a model to estimate traffic accident risk at intersections. Accuracy was verified by comparing the accident information with the results of risk estimation in a specific area.

\*Open data of traffic accident statistics, National Police Agency

[https://www.npa.go.jp/publications/statistics/koutsuu/opendata/index\\_opendata.html](https://www.npa.go.jp/publications/statistics/koutsuu/opendata/index_opendata.html)

## ■ Use Data

The following data are used in each model constructed in this study.

**•Traffic Accident Information**

Period	4 years from January 2019 to December 2022
subject	Accidents between vehicles, and between vehicles and pedestrians

**•People flow data**

Period	1 month from June 1, 2022 to June 30, 2022
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**■ Surveyed subject**

The risk of accidents between vehicles and between vehicles and pedestrians was estimated and evaluated for each target area.

subject	Unsignalized intersections consisting of residential roads
Target Area	4 areas Urban area (more/less accidents), rural urban area (more/less accidents) * *Calculated based on statistical tables from the National Police Agency: <a href="https://www.npa.go.jp/publications/statistics/koutsuu/toukeihyo.html">https://www.npa.go.jp/publications/statistics/koutsuu/toukeihyo.html</a>

**■ Results of the experiment**

Among the results of risk estimation, the points that exceeded a certain risk value were set as dangerous intersections, and their accuracy was verified by comparing them with intersections where accidents actually occurred based on traffic accident statistics.

As a result, it was confirmed that although the number of intersections identified as dangerous was 115, a very small number compared to the total of 13,787, the actual number of accidents among these intersections was 70, a high percentage that was consistent with the total number of accidents that had occurred.

This means that we were able to identify with a high degree of accuracy the dangerous intersections where accidents had actually occurred, and also that the 45 intersections we missed were potentially dangerous intersections with similar characteristics to those where accidents had occurred, although no accidents had occurred.

	High Risk (Danger)	Low Risk (Safe)
With Accidents	70	918
Without Accidents	45	12,754

Table: Relationship Between High-Risk Intersections and Accident Information

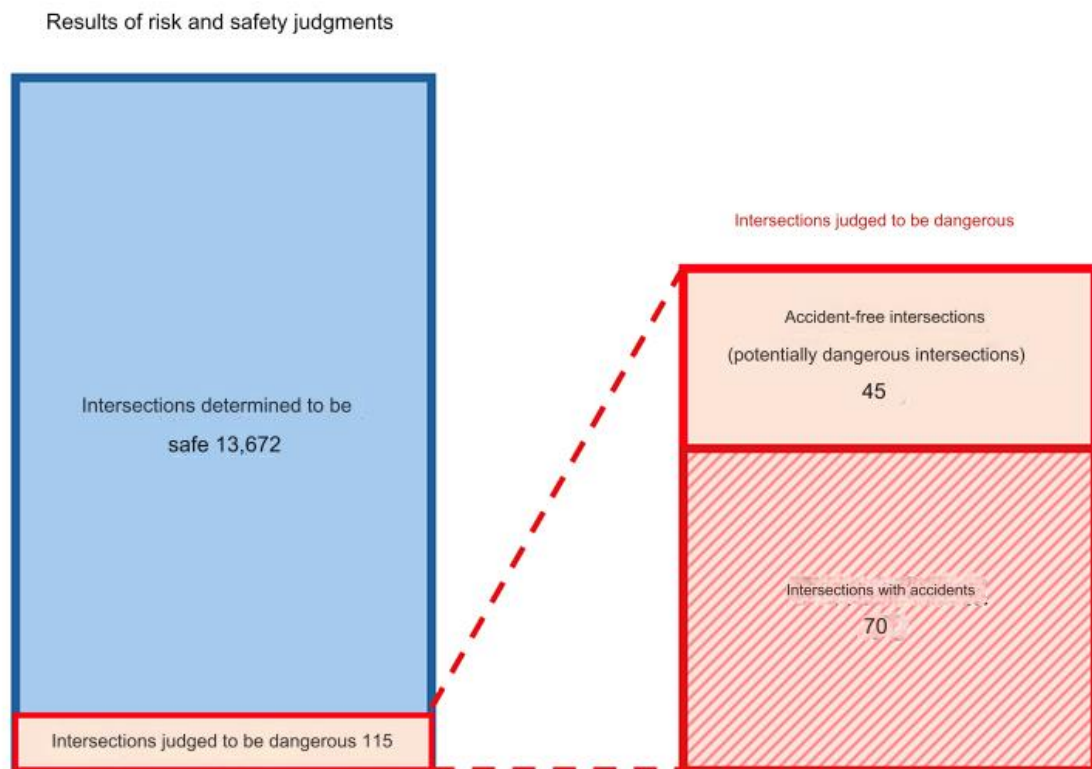


Figure: Breakdown of intersections judged to be dangerous

■ Contribution of features in intersection risk estimation model

In the risk estimation of each type of accident in the intersection risk estimation model, the contributions of features were extracted in order of magnitude, with cross-traffic and merging traffic contributing a high percentage in both vehicle-to-vehicle accidents and vehicle-to-pedestrian accidents. In addition, pedestrian-related features also contributed a high

percentage to the risk estimation for both vehicles and pedestrians.

These indicate that among the extracted features, cross-traffic and merging traffic, in particular, contribute significantly to the accuracy of risk estimation. Furthermore, when estimating the risk of accidents between vehicles and pedestrians, the feature that contributes the most is pedestrian cross-traffic, which means that pedestrian information is an essential and critical element for improving the accuracy of the estimation.

Top 3 features that make a large contribution to estimating the risk of accidents between vehicles



Top 3 features that make a large contribution to estimating the risk of accidents between vehicles and pedestrians



## ■ Future Development

The results of the study confirm that the constructed intersection risk estimation model is capable of estimating accident risk with high accuracy.

This time, we built a model to estimate the universal risk of an intersection without considering the time of day. However, the amount of traffic at an intersection change from moment to moment depending on the time of day, such as morning, noon, and evening, and the risk is expected to change accordingly. Since our human flow data contains time information, we are working hard to develop a model to estimate the risk at each time of day.

We will also work toward commercialization by expanding the scope of target intersections, building a model to enable risk estimation including intersections with traffic signals, and

then extending the area to the entire country for evaluation.

#### ■ Contact Us

Companies wishing to utilize this "Intersection Risk Estimation Model" should contact us at the URL below.

<https://english.geot.jp/contact/support/>

#### ■ About Geo Technologies, Inc.

Our mission is to "Fulfill the Earth with Pleasure." Founded in 1994 as a multimedia software development company, we have been innovating since then, winning the Nikkei Best Software Award for MapFan the following year, followed by the Nikkei Newspaper Company Award for the first i-mode map in Japan. The company has further evolved and is leading the Japanese map industry as a major map company, providing not only map data and location information solutions for corporate clients, but also high-precision 3D data maps that are indispensable for the realization of advanced automated driving.

In addition, "TRIMA," an M2E application that allows users to earn points just by moving around, has been downloaded more than 18 million times\* and is used by many people to enjoy daily transportation and various contents. We are a growing company that is expanding globally by developing NFT, which is rooted in people's daily lives, using blockchain technology both domestically and internationally.

As an ESG Metaverse Company, Geo Technologies will continue to create a predictable world of "Geo-Prediction" by integrating various and enormous big data, including location data and human flow data accumulated over the past 30 years. By integrating cutting-edge technology with a variety of data related to the Earth (Geo), including location data, people flow data, and other diverse and vast big data accumulated over the past 30 years, we will create a world of "Geo-Prediction" and help solve various social issues surrounding the Earth.

\*As of May 2024

Headquarters' location:	Bunkyo Green Court Center Office, 2-28-8 Honkomagome, Bunkyo-ku, Tokyo
Representative:	Hiroshige Sugihara, Chairman & Representative Director Yoichiro Yatsurugi, President & CEO
Founded:	May 1, 1994
Business domains:	<b>Automotive business</b> (Development and edit of navigation data formats, Provision of navigation applications, Verification and evaluation through actual driving and desk check, Sales of map update software for car navigation, Maintenance and development of contents for business (rent-a-car, truck, etc.), Development, maintenance, and edit of high-definition maps for AD/ADAS) <b>GIS business</b> (Map application development kit, Digital map database, Map API for web and

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	business systems, Map web portal "MapFan", Car navigation linkage application "MapFanAssist") <b>Application business</b> (M2E application "TRIMA", "TRIMA Ads", "Geo-Research", Address check service and address geocoding service, Analytics service of flow of people data, NFT marketplace, Web3.0 Blockchain, Application for logistics)
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- URL : <https://geot.jp/>
- Datasets : <https://business.mapfan.com/en/>
- TRIMA : <https://www.trip-mile.com/>
- TRIMA Ads : <https://ads.trip-mile.com/>
- Geo-Research : <https://www.research.trip-mile.com/>
- SUGULOGI : <https://www.sugulogi.com/>