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## WM-2407: Predicting Census Data Using Satellite Imagery

**Inventors:** Daniel Runfola, Anthony Stefanidis, Heather Baier

**Technology Field:** Data science, neural networks, satellite imagery

**Technology Summary:** This innovative system leverages satellite imagery and advanced neural networks to predict census data metrics across large geographic areas of variable scope. The method integrates convolutional neural networks (CNNs), recurrent neural networks (RNNs), and pre-trained models like ImageNet to analyze satellite images at multiple resolutions. By iteratively sampling and processing image data, the system generates accurate socioeconomic predictions for regions where traditional census collection is limited or unavailable.

### Key Innovations:

- Multi-Resolution Analysis: The system uses a "multi-glimpse" approach to process satellite images at varying scales, enhancing its ability to detect features like urban areas, forests, and infrastructure.
- Dynamic Sampling: A Gaussian distribution governs the sampling of geographic regions, enabling the model to focus on relevant areas while ignoring less informative zones.
- Recurrent Neural Network Integration: The RNN with memory capabilities refines predictions iteratively, improving accuracy by learning from prior glimpses.

### Competitive Advantages

- Scalability: Handles geographic regions of varying sizes, from small municipalities to entire countries, with consistent accuracy.
- Cost-Efficiency: Reduces reliance on expensive and time-consuming traditional census methods by utilizing readily available satellite imagery.
- Adaptability: The model can be tailored to specific socioeconomic variables, making it versatile across industries.
- Precision in Sparse Data Areas: Outperforms existing methods by addressing challenges like extreme scope variance.

### Potential Applications:

- Government and Policy Planning: Enables accurate resource allocation and policy design in regions lacking reliable census data.



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- Disaster Management: Assists in identifying vulnerable populations for targeted relief efforts.
- Market Research: Provides demographic insights for businesses entering new markets, especially in developing regions.
- Urban Development: Guides infrastructure planning by predicting population density and urban growth patterns.

**Licensing Status:** Recently licensed on a non-exclusive basis; available for licensing to new licensees only on a non-exclusive basis

**Intellectual Property:** Pending United States patent application 18/897,114

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