

## 1. Open Source Applications for Travel Guides

I used Github to find these open source projects:

**Travel-Mate (project-travel-mate/Travel-Mate)**: An Android app for travelers, providing destination selection, bookings, trip organization, and features like weather updates or nearby attractions. Code is in Java/Android; useful for mobile travel guides.

- GitHub: <https://github.com/project-travel-mate/Travel-Mate>
- Stars/Forks: 1.2k/400+
- (active until 2023).

**AdventureLog (seanmorley15/AdventureLog)**: A self-hostable web app for tracking travels, mapping visited places, collaborative planning, and logging adventures with ratings/activities. Built with modern web tech (e.g., Node.js); ideal for personalized travel journals.

- GitHub: <https://github.com/seanmorley15/AdventureLog>
- Stars/Forks: Moderate activity; self-hostable for privacy.

**SmartTourister** A fully AI/ML-based itinerary recommendation system with UI forms, and a setup for Facebook chatbot integration, more broader than our project and doesn't use model training the same way.

- GitHub: <https://github.com/salil-gtm/SmartTourister>
- Features: Social media data collection, multiple input methods
- Relevant to your project: Similar Twitter scraping approach (**Somewhat, it uses data based on old Twitter methods, also the project while providing good ideas for our own, doesn't look much complete** as first commit was 7 years ago)

**Tourmate Travel Planning Application (carpentrycoder/tourmate1)**: A desktop app for comprehensive travel planning, including destinations, bookings, and guides. Built with Java; simple for beginners to modify.

- GitHub: <https://github.com/carpentrycoder/tourmate1> (hosted via GitHub Pages).
- Stars/Forks: Smaller repo, but code-focused.

**Bhromon (travel-guide-app topic example)**: A web app integrating Google services for travel planning, bookings, and guides. Includes tools for hotels, cars, and personalized experiences; likely React-based.

(The use of google services here could be of interest to us)

- GitHub: [travel-guide-app · GitHub Topics](#)
- Stars/Forks: 2

## **Travel Recommendation System**

Uses KNN Algorithm for nearby recommendations, K-Means for rating and price-based recommendations, and provides user-personalized suggestions.

(Project has some of its features missing, but the idea of using K-clustering could be relevant to us)

- **Github:**<https://github.com/shr1911/Tourism-Recommendation>
- **Features:** Personalized recommendations based on user preferences
- **Good for:** User preference modeling

## **AI-Enhanced Tourism Recommendation System**

A web-based application that provides personalized travel recommendations using machine learning and NLP techniques, suggesting destinations, activities, and accommodations.

- **GitHub:**[Ayaanjawaid/AI-Enhanced-Tourism-Recommendation-System](https://github.com/Ayaanjawaid/AI-Enhanced-Tourism-Recommendation-System)
- **Tech Stack:** ML + NLP
- **Good for:** NLP implementation patterns

As all these are on Git, they can easily be forked using clone command.

## **Most Relevant to our Project:**

For **LahoreLens**, I'd recommend this order:

1. **SmartTourister** - Similar social media scraping approach
2. **AI-Enhanced Tourism Recommendation System** - NLP + ML implementation
3. **Tourism Recommendation System** - Multiple algorithm approaches (KNN, K-Means)
4. **Travel-Mate** - Full application architecture reference

## Comparison of Travel Applications and Related Work

Application Name	Type	Primary Features	Personalization	AI/ML Features	Relevance
TripAdvisor	Global Travel Guide & Reviews	<ul style="list-style-type: none"> <li>User-generated reviews &amp; ratings</li> <li>Photo sharing</li> <li>Booking integration</li> <li>Points of interest database</li> </ul>	Basic recommendation based on popularity ranking	Limited - mainly popularity-based algorithms	★★★ Similar user-generated content but lacks real-time social media analysis
Google Maps/Travel	Navigation & Discovery	<ul style="list-style-type: none"> <li>Comprehensive location database</li> <li>User reviews</li> <li>Real-time navigation</li> <li>Business info</li> <li>Google Flights integration</li> </ul>	Location-based suggestions, search history	Basic ML for route optimization and recommendations	★★★★ Strong location services but no social media sentiment analysis
Wanderlog	Trip Planning & Itinerary	<ul style="list-style-type: none"> <li>Collaborative trip planning</li> <li>Budget tracking</li> <li>Color-coded maps</li> <li>Restaurant recommendations</li> <li>Offline access</li> </ul>	Group preferences, past trip patterns	Moderate - curated recommendations with ML	★★ Focus on planning rather than real-time discovery
Klook	Tours & Experience Booking	<ul style="list-style-type: none"> <li>Discounted attraction tickets</li> <li>Day tours booking</li> <li>Food experiences</li> <li>Event partnerships</li> <li>Transport booking</li> </ul>	Purchase history, location-based	Limited - mainly marketplace model	★★ Marketplace model vs. data-driven recommendations
Viator (TripAdvisor Co.)	Tour Booking Platform	<ul style="list-style-type: none"> <li>Last-minute booking</li> <li>Tour marketplace</li> <li>User reviews</li> <li>Flexible cancellation</li> </ul>	Booking history, preferences	Basic recommendation algorithms	★★ Vendor-focused, not data mining approach
Roadtrippers	Road Trip Planning	<ul style="list-style-type: none"> <li>Custom route planning</li> <li>Activity suggestions along routes</li> <li>Auto-routing</li> <li>Offline maps</li> <li>RV compatibility</li> </ul>	Route preferences, travel style	Moderate - route optimization algorithms	★ US-focused, different use case

Sygic Travel	City Guides & Trip Planning	<ul style="list-style-type: none"> <li>Curated city guides</li> <li>Offline maps</li> <li>In-depth activity suggestions</li> <li>360° photos</li> <li>Itinerary planning</li> </ul>	Past searches, saved places	Limited - mainly curated content	★★ Static curated content and dynamic social data
izi.TRAVEL	Audio Tour Guide	<ul style="list-style-type: none"> <li>Self-guided audio tours for 2,500+ cities</li> <li>Museum guides (3,000+)</li> <li>AI itineraries</li> <li>Offline content</li> </ul>	AI-generated itineraries based on preferences	AI itinerary generation	★★★ Good AI integration but different content type
Airbnb Experiences	Local Experience Booking	<ul style="list-style-type: none"> <li>Host-led experiences</li> <li>Cultural activities</li> <li>Food tours</li> <li>Virtual experiences</li> <li>Community-based</li> </ul>	Booking history, search preferences	Recommendation engine based on user behavior	★★ Experience marketplace, not analytical approach

#### Key Insights for LahoreLens:

- Real-Time Social Media Analysis:** None of these apps actively mine Twitter/social media for current trends and sentiment
- NLP-Driven Insights:** Most rely on structured reviews rather than unstructured text processing
- Lahore-Specific Focus:** No existing app provides deep, AI-driven insights specifically for Lahore
- Topic Modeling:** Our LDA approach for discovering hidden themes is unique
- SNA for Personalization:** Social network analysis on user behavior is more sophisticated than simple popularity rankings

#### Features to see:

- TripAdvisor:** User review aggregation and rating systems
- Google Maps:** Location database structure and real-time data handling
- Wanderlog:** Budget tracking and collaborative features for UI inspiration
- izi.TRAVEL:** AI itinerary generation approach
- Klook:** Booking integration for monetization potential

### **3. Literature Review: Top 5 Papers Using AI for Online Image Analysis**

#### **1. Fusing Global and Local Features for Generalized AI-Synthesized Image Detection (2022)**

Authors: Y Ju, S Jia, L Ke, et al. Conference: IEEE International Conference on Multimedia and Expo. Abstract: Proposes a fusion model for detecting AI-generated images online using global/local features. Key Findings: Achieves 95%+ accuracy on datasets like GAN-generated images; useful for social media verification

<https://ieeexplore.ieee.org/abstract/document/9897820/>

#### **2. Do deep learning models accurately measure visual destination image? A comparison of a fine-tuned model to past work"**

**Publication:** Information Technology & Tourism (2024)

**Source:** Springer

#### **Key Contributions:**

- Presents a new approach where deep learning models are fine-tuned for a predetermined set of cognitive attributes of destination image, training state-of-the-art neural networks using labelled tourist photography and testing accuracy by comparing results with a ground truth dataset .
- Focuses on accuracy measurement of visual destination image
- Addresses the challenge of destination managers and marketers making better decisions

#### **Methodology:**

- Fine-tuned deep learning models
- Neural network training on labelled tourist photos
- Ground truth validation approach

**3. A computer vision-based concept model to recommend domestic overseas-like travel experiences: A design science study"**

**Publication:** Tourism Management Perspectives (2023)

**Source:** ScienceDirect

**Key Contributions:**

- Focuses on development of a recommendation model based on visual content of photos for domestic overseas-like travel experiences and a prototype application, using the latest advancement in computer vision — the concept model
- Creates a prototype application demonstrating practical implementation
- Uses cutting-edge computer vision techniques

**Methodology:**

- Design science research approach
- Computer vision concept model
- Recommendation system based on visual similarity

**4. Social Media Image and Computer Vision Method Application in Landscape Studies: A Systematic Literature Review"**

**Authors:** Multiple authors (systematic review)

**Publication:** Land, MDPI (February 2024)

**DOI/Link:** <https://www.mdpi.com/2073-445X/13/2/181>

**Google Scholar:** Search: "Social Media Image Computer Vision Landscape Studies MDPI 2024"

**Key Contributions:**

- Systematically reviews 55 landscape studies that use computer vision methods to interpret social media images and summarizes their spatiotemporal distribution, research themes, method trends, platform and data selection, and limitations
- Demonstrates efficient processing of large samples of crowdsourced images with accurate interpretation
- Provides comprehensive overview of current state-of-the-art in social media image analysis for tourism/landscape studies

**Methodology:**

- Systematic literature review of 55 studies
- Analysis of spatiotemporal distribution patterns
- Platform and data selection evaluation
- Machine learning trends identification
- Image analysis techniques

**This project can said to be highly Relevance to LahoreLens as:**

- Directly addresses social media image analysis
- Provides best practices from 55 studies for platform selection (Twitter, Instagram, etc.)
- Shows how to handle large-scale crowdsourced visual data
- Identifies current limitations and future research directions
- Can guide image collection and processing pipeline design
- Validates the feasibility of using social media images for location-based insights

**5. Deep learning and Internet of Things for tourist attraction recommendations in smart cities**

**Authors:** Research team (specific names in full paper)

**Publication:** Neural Computing and Applications, Springer (December 2023)

**DOI/Link:** <https://link.springer.com/article/10.1007/s00521-021-06872-0>

**Google Scholar:** Search: "Deep learning IoT tourist attraction recommendations smart cities 2023"

**Key Contributions:**

- Proposes a tourist attraction IoT-enabled deep learning-based recommendation system to enhance tourist experience in a smart city where travelers enter details about their travels (traveling alone or with a companion, type of companion such as partner or family with kids, traveling for business)
- Integrates Internet of Things (IoT) sensors with deep learning models
- Creates personalized recommendations based on traveler context and preferences
- Demonstrates smart city infrastructure integration for tourism

**Methodology:**

- IoT-enabled data collection architecture
- Deep learning-based recommendation algorithms
- Context-aware filtering (travel party composition, purpose)
- Real-time data processing from smart city sensors
- User preference modeling with multiple parameters

**Relevance to LahoreLens:**

- Context-aware recommendation approach aligns with your SNA personalization
- Demonstrates scalable architecture for smart city applications
- Can enhance your system with real-time environmental data
- Provides framework for handling diverse user contexts
- Validates the combination of deep learning with recommendation engines

# How Image-to-Text Transformation Works

Image-to-text transformation (also called **image captioning** or **visual description generation**) uses deep learning models to analyze visual content and generate natural language descriptions. The process involves:

1. **Image Encoding:** Vision models extract visual features from images
2. **Feature Mapping:** A connector layer maps visual features to text embeddings
3. **Text Generation:** Language models generate descriptive text based on visual features

## 4 . Top AI Models & Frameworks for Image-to-Text

### 1. BLIP / BLIP-2 (Salesforce)

**Best for:** General-purpose image captioning

**Key Features:**

- Uses bootstrapping to generate synthetic captions and filter noisy ones from web data
- Uses deep learning to interpret images into descriptive captions with high accuracy using natural language processing and computer vision
- BLIP-2 is a zero-shot visual-language model that can be used for multiple image-to-text tasks with image and text prompts

**Implementation:**

- **Hugging Face Models:**
  - Salesforce/blip-image-captioning-base
  - Salesforce/blip-image-captioning-large
- **GitHub:** <https://github.com/salesforce/BLIP>
- Pre-trained & ready to use

### 2. LLaVA (Large Language and Vision Assistant)

**Best for:** Conversational image understanding

**Key Features:**

- Achieves 85.1% relative score compared with GPT-4 in multimodal settings
- Trained on only 80,000 images and showed similar inference results compared to GPT-4
- Seen as an Open-source alternative to GPT-4 Vision

## **Implementation:**

- **GitHub:** <https://github.com/haotian-liu/LLaVA>
- **Ollama:** Available as ollama run llava
- Can run locally

## **3. CLIP (OpenAI)**

**Best for: Image-text matching and zero-shot classification**

### **Key Features:**

- Maps images and text to same embedding space
- Excellent for image search and similarity
- Pre-trained on 400M image-text pairs

### **Use in LahoreLens:**

- Match social media images with text descriptions
- Find visually similar locations
- Zero-shot landmark classification

## **4. Google Cloud Vision AI(Highly relevant)**

**Website:** <https://cloud.google.com/vision>

### **Capabilities:**

- Uses image recognition to create computer vision apps and derive insights from images and videos with pre-trained APIs
- Label detection, OCR, landmark detection
- Safe search detection
- Image properties analysis

### **Pricing:**

- Google offers **1,000 free units per month** for many features of Vision API (label detection, text detection/ OCR, face detection, etc.) before you start getting charged.
- Limit resets each month.

### **Pricing Example, directly from vision page:**

If your application made the following requests in a particular month:

- 700 images with label detection
- 5300 images with landmark detection

Your cost would be:

- \$0 for 700 label detection requests.
- \$0 for the first 1000 landmark detection requests.
- \$6.45 for the remaining 4300 landmark detection requests. Pricing is calculated in 1000-request blocks with the final request block prorated out of 1000.

### **Best for LahoreLens:**

- Landmark recognition in Lahore
- Text extraction from restaurant menus
- Image labeling for categorization

## **6. Microsoft Azure AI Vision (Highly Relevant)**

**Website:** <https://azure.microsoft.com/en-us/products/ai-services/vision/>

### **Capabilities:**

- Provides powerful image analysis and recognition using pre-trained AI models.
- Performs **object and scene detection, OCR (text extraction), landmark identification**, and image description generation.
- Supports **Custom Vision**, allowing developers to train their own models for domain-specific image categories (e.g., Lahore landmarks or food types).
- Integrates with other Azure AI services (Language, Search, Cognitive APIs) for multimodal insights.

### **Pricing:**

- Azure offers a **Free (F0)** tier that includes up to **5,000 image transactions per month**, with a rate limit of about **20 transactions per minute**.
- The Custom Vision Free tier allows 2 projects, each with up to 5,000 training images, and 10,000 prediction transactions per month.

## Best for LahoreLens:

- **Landmark detection and tagging** of famous Lahore sites (Badshahi Mosque, Minar-e-Pakistan, etc.).
- **Custom Vision training** for city-specific or culturally-unique image categories.
- **Text extraction (OCR)** for analyzing restaurant menus, signboards, or street images.
- **Face and object detection** for crowd analysis or tourism sentiment mapping

## Comparison Table

	Type	Deployment	Cost	Accuracy	Best Use Case	LahoreLens Integration
<b>BLIP/BLIP-2</b>	Open-source Model	Self-hosted or HuggingFace API	Free (self-host) or API pricing	High	General captioning	Offline, customizable
<b>LLaVA</b>	Open-source Model	Self-hosted	Free	85% of GPT-4 performance	Conversational image Q&A	Great for chatbot integration
<b>Google Cloud Vision</b>	Cloud API	Cloud-based	Free/1000 images	Very High	Enterprise production	Reliable, scalable
<b>Azure Computer Vision</b>	Cloud API	Cloud-based	Free/5000 images	Very High	Caption generation	Built-in captioning

(I would recommend starting with Google Cloud's and Azure's Free tiers)

**Recommended Architecture for LahoreLens:**

**Phase 1: MVP (Free Self Hosting/API)**

Social Media Images → BLIP-2 (HuggingFace) → Image Captions → MongoDB



CLIP Embeddings → Similarity Search

**Phase 2: Production (Scalable)**

Social Media Images → Azure Computer Vision API → Captions + Labels



Custom Fine-tuned BLIP → Lahore-specific descriptions



Store in MongoDB with NLP-extracted entities