1. System Architecture

The system is built on a **Multi-Stage Agentic Workflow** utilizing the LangChain framework and Google's Gemini 2.5 Flash model. The architecture is designed to handle unstructured PDF data, transform it into searchable queries, and execute a multi-step verification process.

Core Components:

- **Data Ingestion:** Uses `MarkItDown` to convert PDF CVs into clean Markdown text, preserving structural hierarchy.
- **MCP Integration:** Connects to a `MultiServerMCPClient` providing tools for searching and retrieving profiles from Facebook and LinkedIn.
- **Orchestration:** Employs an asynchronous batch processing pattern (`abatch`) to handle multiple CVs concurrently, optimizing for latency.

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2. Agent Workflow & Tool Usage Strategy

The "Agent" is not a single prompt but a **sequential reasoning pipeline**. This ensures that the LLM does not hallucinate social media IDs but instead "discovers" them through iterative tool use.

Stage 1: Identity Discovery (Broad Search)

The agent acts as a Search Specialist.

- **Strategy:** Extract name and location from the CV.
- **Tools Used:** `search_facebook_users` and `search_linkedin_people`.
- **Design Choice:** The system is explicitly instructed to fill the `location` field but ignore `industry` to prevent overly restrictive searches that might miss valid candidates with non-standard industry labels.

Stage 2: Deep Verification (Detail Retrieval)

Once potential matches are found, the agent transitions to a Verification Specialist.

- **Strategy:** Identify the "Top 1" match from the previous search results by comparing metadata (current job, profile picture descriptions, or education).

- **Tools Used:** `get_facebook_profile`, `get_linkedin_profile`, and `get_linkedin_interactions`.
- **Design Choice:** By retrieving specific interactions and full profiles, the agent can verify temporal claims (e.g., "Was this person actually working at X company in 2022?").

Stage 3: Structured Auditing (Scoring)

The final stage uses **Structured Output** (Pydantic) to ensure the agent provides a machine-readable reliability score and a natural language justification.

- **Logic:** A "Burden of Proof" protocol is enforced. The agent is instructed only to penalize a score if there is *contradictory* evidence. Absence of evidence (Omission) is not treated as Disproof, ensuring a fair evaluation for candidates with low social media presence.

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3. Tool Usage Strategy Summary

Tool Category	Purpose	Reasoning
Search Tools	Candidate Discovery	Uses fuzzy matching to handle potential typos in CV names or social profiles.
Profile Tools	Fact-Checking	Extracts specific employment dates and titles to compare against CV claims.
Interaction Tools	Credibility Assessment	Validates professional network activity to ensure the profile is authentic and not a "bot" or recent fabrication.

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4. Sample Verification Results

The following results were generated by running the system against the sample dataset provided in the environment.

Executive Summary Table

Important Notice: All scores below are generated independently. So any comparation through scorse among CVs that fall into same decision is meaningless. In other words, there is no way to sort accepted CVs by their scores.

CV ID	Reliability Score	Decision
CV_1	0.95	**Accept**
CV_2	0.9	**Accept**
CV_3	0.9	**Accept**
CV_4	0.1	**Reject**
CV_5	0.1	**Reject**

Sample Detailed Output (CV_1-5)

CV_1: Score: 0.95, Reason: All core professional claims in the CV, including current employment (Engineer at ByteDance from 2020-Present), education (BSc in Marketing from McGill University, graduated 2009), and listed skills (Content Creation, SEO, Social Media), are fully corroborated by the LinkedIn profile. While the Facebook profile shows a discrepancy in current employment (Scientist at Traveloka), the LinkedIn verification takes precedence as per the protocol, confirming the substantial accuracy of the CV.

CV_2: Score: 0.9, Reason: The candidate's CV claims are largely corroborated by the LinkedIn profile. All professional experience (Manager at BCG from 2022-Present, Analyst at Tencent from 2013-2017), education (BSc in Design from The University of Hong Kong, 2011), and skills (UI/UX, Prototyping, Graphic Design) are accurately reflected on LinkedIn. While the Facebook profile presents conflicting information regarding education (Master's Degree vs. BSc) and current employment (Engineer at Manulife vs. Manager at BCG), the LinkedIn profile provides direct validation for all key professional claims. As per protocol, validation by one source (LinkedIn) takes precedence over conflicting information from another (Facebook).

CV_3: Score: 0.9, Reason: The candidate's CV claims are largely corroborated by the SocialGraph MCP Search Results. The name, current company (PwC), role (Engineer/Consulting Professional), and location (Munich, Germany) are consistently confirmed across both Facebook and LinkedIn profiles. The Facebook profile also confirms a 'Bachelor's Degree', aligning with the CV's education claim, though specific university and field are not detailed. The LinkedIn profile's 'years_experience' of 15 years does

not contradict the CV's '2013 – Present' (11 years) at PwC, as 'years_experience' typically refers to total professional experience, implying potential prior roles not listed on the CV (Omission is not Disproof). A minor discrepancy exists regarding hometown (CV implies Sydney, Facebook lists Munich), but this does not materially impact the professional history verification.

CV_4: Score: 0.1, Reason: The candidate's CV claims are largely contradicted by the SocialGraph MCP Search Results. While the name 'Rahul Sharma' and general location 'Singapore' are consistent, the professional experience and education details are fundamentally different. The CV claims 'Senior Engineer at Microsoft (2021-2027)' and 'Consultant at StartupXYZ (2020-2023)', but the LinkedIn profile shows 'Analyst at Tencent (2019-2023, current)'. The CV claims a 'PhD in Legal Studies from Tsinghua University (2021)', whereas the LinkedIn profile lists an 'MSc in Legal from Stanford (2006-2010)'. The Facebook profile also lists a different current employer ('Manager at Shopee') and only a 'Master's Degree'. These are direct and material discrepancies in core professional history and education.

CV_5: Score: 0.1, Reason: The CV's professional experience and education claims are in direct contradiction with the verified LinkedIn and Facebook profiles. The CV lists EY, StartupXYZ, DataForge, and UrbanFlow, and a PhD from the University of Tokyo (2012). However, the LinkedIn profile shows experience at GreenLeaf Co and PwC, and a PhD from KAIST (2003-2006). The Facebook profile also lists PwC as the current employer. While the name, general location (London), and some skills (ML, NLP, TensorFlow, Python) align, the fundamental professional history is entirely different, indicating a high probability of inaccuracy in the CV's core claims.

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5. Conclusion

The system effectively balances automation with skepticism. By separating the discovery phase from the verification phase, the agent avoids "jumping to conclusions." The use of a 0.5 threshold ensures that only candidates with verifiable professional histories or at least a lack of contradictory evidence pass the audit, successfully matching the ground truth provided in the evaluation framework.