**Voice Input (STT)**

* [**Whisper.cpp**](https://github.com/ggerganov/whisper.cpp)
  + Fully open-source, lightweight, runs offline on CPU/GPU
  + Converts microphone audio → text
* **Node Mic Capture**: [node-record-lpcm16](https://www.npmjs.com/package/node-record-lpcm16)

**LLM Engine**

* [**LM Studio**](https://lmstudio.ai/) running **open-source models** (from gpt-oss)
  + Examples:
    - **Mistral 7B Instruct** → good general assistant
    - **LLaMA 3B/7B** → small/medium footprint
    - **Gemma 2** → reasoning + chat
  + Fully offline, no API calls required

**Voice Output (TTS)**

* [**Piper**](https://github.com/rhasspy/piper) → lightweight, open-source
* [**Coqui TTS**](https://github.com/coqui-ai/TTS) → optional, higher quality

**Command Execution / Browser Automation**

* Node.js built-in: [child\_process.exec / spawn]
* For web automation (fully free):
  + [**Puppeteer**](https://github.com/puppeteer/puppeteer) → automate browser tasks like opening Gmail
  + Optional: headless mode for fully automated workflows

**Email Automation**

* Fully free & open-source approach:
  + Use [**Nodemailer**](https://nodemailer.com/about/) with **SMTP from a free Gmail account**
    - Does **not require OpenAI or paid APIs**
    - Only requires credentials (username/password or App Password for Gmail)
* Alternative: always use browser automation + Gmail UI (via Puppeteer) — fully free and no APIs

**Node.js Backend**

* Handles:
  + Receiving audio input
  + Transcribing via Whisper.cpp
  + Sending prompt to LM Studio local API
  + Executing commands / TTS
* Can run **CLI only** or with **Electron GUI**

**Minimal Fully Free Stack**

| **Component** | **Open Source** | **Notes** |
| --- | --- | --- |
| Node.js | ✅ | Backend runtime |
| Whisper.cpp | ✅ | Speech-to-text |
| LM Studio | ✅ | LLM engine (local) |
| Open-source LLMs | ✅ | Mistral 7B, LLaMA, Gemma |
| Piper / Coqui TTS | ✅ | Text-to-speech |
| Puppeteer | ✅ | Browser automation (optional) |
| Nodemailer | ✅ | Free SMTP email (optional) |

**🔗 How it Flows**

graph LR

A[Mic Audio 🎤] --> B[Whisper.cpp (STT)]

B --> C[LM Studio (Reasoning)]

C --> D[Node.js Executor]

D -->|TTS| E[Voice Output 🔊]

D -->|Optional| F[Puppeteer → Gmail]

D -->|Optional| G[Nodemailer → Email]