

教學創新精進子計畫：A1建置跨域學習共構校園

NODE-RED感測網路領域之實務

啟動數據之眼：政府公開資料運用於感測網路基礎與視覺化儀表板

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課程目標

- ◆ Node-RED基礎+ gemini AI 生成與分析(4/13)
- ◆ 政府公開資訊抓取數據
- ◆ 視覺化儀表板
- ◆ 即時影像擷取儀表板

NODE-RED 是什麼?

Node-RED 是由 IBM 開發的 **流程式 (Flow-based) 開發工具**，主要特色是：

用「**拉線流程圖**」方式寫程式

適合 **IoT**、**資料整合**、**自動化**

常用在 **感測器**、**設備控制**、**API整合**

NODE-RED 專題方向

Node-RED 可以把 **感測器**、**API**、**AI模型**、**資料庫** 用流程圖串起來，適合學生做 IoT + AI 專題。

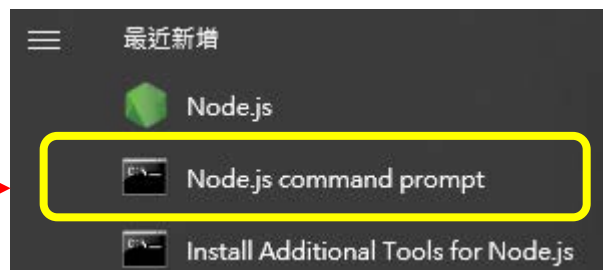
- AI 智慧環境監測系統：AI分析空氣品質
- AI 智慧家庭 (Smart Home)：AI判斷情境
- AI影像辨識警報系統：AI影像辨識
- AI智慧農業系統：AI判斷灌溉時間
- AI客服 / AI聊天機器人：AI模型 (LLM)

NODEJS安裝

1. 下載Nodejs : <https://nodejs.org/en/download>

2. 使用CMD命令提示

`npm install -g --unsafe-perm node-red`



3. NodeRed啟動

`node-red`

```
Node.js command prompt
Your environment has been set up for using Node.js 24.14.1 (x64) and npm.
C:\Users\jimmy>npm install -g --unsafe-perm node-red
npm warn "node-red" is being parsed as a normal command line argument.
npm warn Unknown cli config "--unsafe-perm". This will stop working in the next major version of npm.
added 275 packages in 1m
53 packages are looking for funding
  run `npm fund` for details
npm notice
npm notice New minor version of npm available! 11.11.0 -> 11.12.1
npm notice Changelog: https://github.com/npm/cli/releases/tag/v11.12.1
npm notice To update run: npm install -g npm@11.12.1
npm notice
C:\Users\jimmy>
```

```
node-red
12 Apr 09:05:38 - [info] Node-RED version: v4.1.8
12 Apr 09:05:38 - [info] Node.js version: v24.14.1
12 Apr 09:05:38 - [info] Windows_NT 10.0.19045 x64 LE
12 Apr 09:05:39 - [info] Loading palette nodes
12 Apr 09:05:40 - [info] Settings file : C:\Users\jimmy\.node-red\settings.js
12 Apr 09:05:40 - [info] Context store : 'default' [module=memory]
12 Apr 09:05:40 - [info] User directory : C:\Users\jimmy\.node-red
12 Apr 09:05:40 - [warn] Projects disabled : editorTheme.projects.enabled=false
12 Apr 09:05:40 - [info] Flows file : C:\Users\jimmy\.node-red\flows.json
12 Apr 09:05:40 - [info] Creating new flow file
12 Apr 09:05:40 - [warn]

-----
Your flow credentials file is encrypted using a system-generated key.


If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.

You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.
-----
12 Apr 09:05:40 - [info] Server now running at http://127.0.0.1:1880/
12 Apr 09:05:40 - [warn] Encrypted credentials not round
12 Apr 09:05:40 - [info] Starting flows
12 Apr 09:05:40 - [info] Started flows
```

Windows 安全性警訊

Windows Defender 防火牆已封鎖此應用程式的部分功能

Windows Defender 防火牆已在所有公用及私人網路上封鎖 Node.js JavaScript Runtime 的部分功能。

	名稱(N): Node.js JavaScript Runtime
	發行者(P): Node.js
	路徑(H): C:\program files\nodejs\node.exe

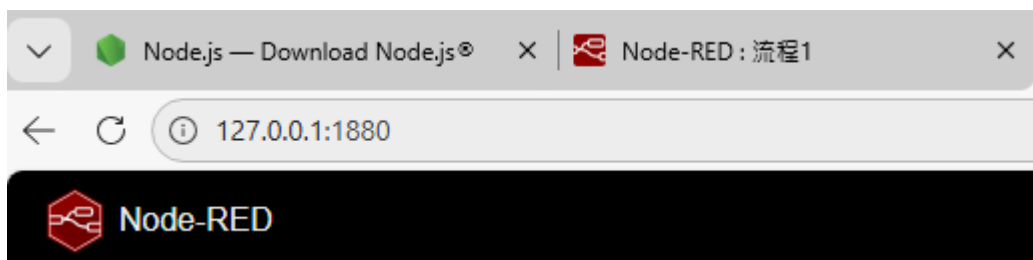
允許 Node.js JavaScript Runtime 在這些網路上通訊:

- 私人網路，例如家用或工作場所網路(R)
- 公用網路，例如機場和咖啡廳網路 (這些網路的安全性通常比較低或沒有任何安全性，因此不建議使用)(U)

[允許應用程式通過防火牆的風險為何?](#)

NODE-RED 初始畫面

開啟瀏覽器，輸入：<http://127.0.0.1:1880>



Enable Update Notifications

Node-RED can notify you when there is a new version available. This ensures you keep up to date with the latest features and fixes.

This requires sending anonymised data back to the Node-RED team. It does not include any details of your flows or users.

For full information on what information is collected and how it is used, please see the [documentation](#).

You can change this setting at any time in the User Settings.

Yes, enable notifications

No, do not enable notifications

基礎操作練習

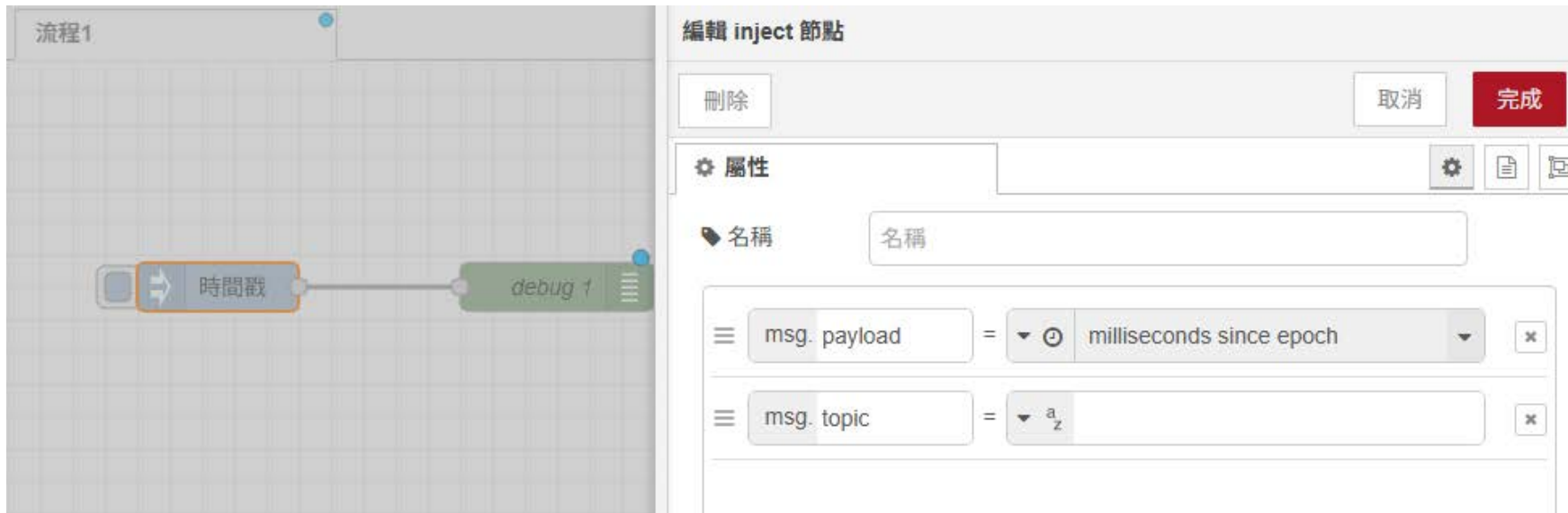
The image shows the Node-RED web interface. At the top left is the Node-RED logo and name. The main workspace is titled '流程1' (Flow 1) and contains a workflow with two nodes: a blue '時間戳' (Timestamp) node and a green 'debug 1' node, connected by a line. The left sidebar shows a search bar '過濾已安裝模組' and a list of nodes under the '共通' (Common) category, including inject, debug, complete, catch, status, link in, and link call. The right sidebar is the '除錯窗口' (Debug Console), which displays a log entry: '2026/4/12 上午9:17:13 node: debug 1 msg.payload : number' and a timestamp '2026/4/12 上午9:17:12 [UTC+8]'. The interface is in Chinese.

認識訊息流結構

msg : 訊息流 (msg可以自建任意屬性ex msg.url 、 msg.date)

payload : 訊息流本文部分

topic : 訊息流名稱



The screenshot shows a workflow editor interface. On the left, a workflow canvas displays two nodes: '時間戳' (Timestamp) and 'debug 1'. The '時間戳' node is highlighted with an orange border. On the right, the '編輯 inject 節點' (Edit inject node) panel is open. It features a '名稱' (Name) field containing '名稱'. Below this, there are two configuration rows for the inject node's output. The first row shows 'msg. payload' set to 'milliseconds since epoch'. The second row shows 'msg. topic' set to 'a_z'. The panel includes buttons for '刪除' (Delete), '取消' (Cancel), and '完成' (Done), along with icons for settings, save, and refresh.



A dropdown menu is shown, listing various data types for selection. The selected item is '時間戳記' (Timestamp). The list includes: 'flow.', 'global.', 'a_z 文字列' (String), '0-9 數字' (Number), '布林' (Boolean), 'JSON', '01/10 二進位流' (Binary stream), '時間戳記' (Timestamp), 'J: 表達式' (Expression), '\$ 環境變量' (Environment variable), and 'msg.'.

注入資料抓取特定資訊

```
{"temp":35, "humi":65,"light":520}
```

The screenshot displays a Node-RED workflow titled "流程1" (Flow 1). It begins with an "注入" (Inject) node, which is connected to three parallel "抓取" (Fetch) nodes: "抓取溫度" (Fetch Temperature), "抓取濕度" (Fetch Humidity), and "抓取亮度" (Fetch Light). Each of these nodes is connected to a corresponding "debug" node (debug 1, debug 2, and debug 4). The right-hand side of the image shows the "除錯窗口" (Debug Console) with the following log entries:

```
2026/4/12 上午9:47:12 node: debug 1  
msg.payload : Object  
  { temp: 32, humi: 55, light: 450 }  
2026/4/12 上午9:47:12 node: debug 2  
msg.payload : number  
32  
2026/4/12 上午9:47:12 node: debug 3  
msg.payload : number  
55  
2026/4/12 上午9:47:12 node: debug 4  
msg.payload : number  
450
```

RANGE

range : 用來改變範圍 (亮度值通常在0-4095之間, 轉到0 - 100%)

0=最亮 4095=最暗

流程1

編輯 range 節點

刪除 取消 完成

屬性

屬性: msg.payload

操作: 按比例msg.payload

映射輸入資料:

從: 0 到: 4095

至目標範圍:

從: 100 到: 0

取最接近整數?

除錯窗口

所有節點 all

2026/4/12 上午9:53:08 node: debug 1
msg.payload : Object
{ temp: 32, humi: 55, light: 450 }

2026/4/12 上午9:53:08 node: debug 2
msg.payload : number
32

2026/4/12 上午9:53:08 node: debug 3
msg.payload : number
55

2026/4/12 上午9:53:08 node: debug 4
msg.payload : number
89.01098901098901

2026/4/12 上午9:53:26 node: debug 1
msg.payload : Object
{ temp: 32, humi: 55, light: 450 }

SWITCH設定條件

Switch：類似if功能，用於設定資訊流走向。

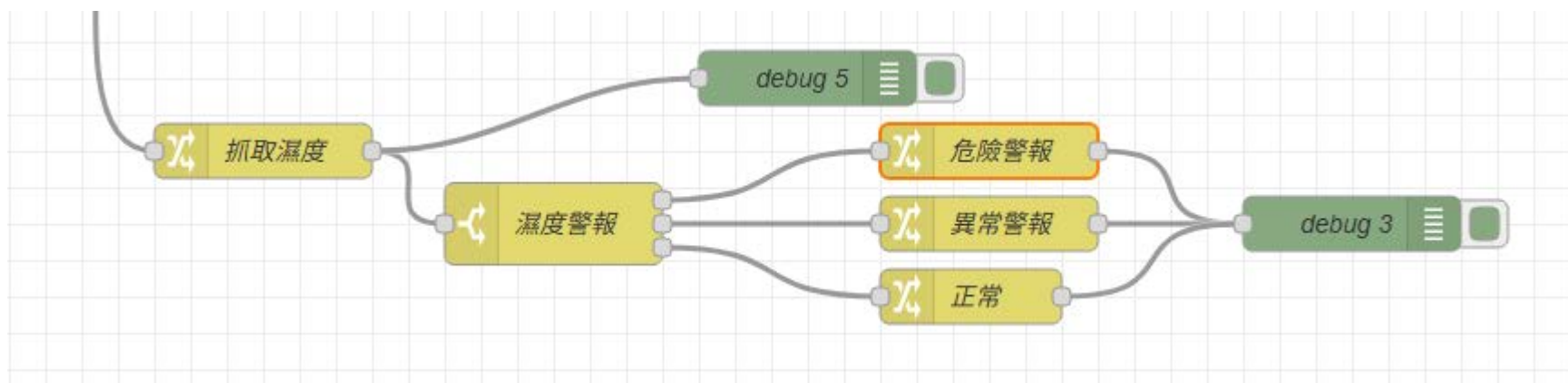
The image displays a workflow editor interface. On the left, a workflow titled "流程1" (Flow 1) is shown. It starts with a "抓取溫度" (Fetch Temperature) node, which branches into three paths: one leading to a "debug 1" node, another to a "debug 2" node, and a third to a "濕度警報" (Humidity Alert) node. The "濕度警報" node is further divided into three sub-nodes: "危險警報" (Danger Alert), "異常警報" (Abnormal Alert), and "正常警報" (Normal Alert). The "濕度警報" node also receives input from a "亮度" (Brightness) node, which is preceded by a "抓取亮度" (Fetch Brightness) node. A "debug 4" node is connected to the "亮度" node, and a "debug 5" node is connected to the "濕度警報" node.

On the right, the "編輯 switch 節點" (Edit Switch Node) dialog is open. It features a "名稱" (Name) field set to "濕度警報" (Humidity Alert) and a "屬性" (Property) dropdown set to "msg.payload". Below these are three rule conditions:

- Rule 1: \geq 70 (with a percentage sign icon) → 1
- Rule 2: 在之間 (Between) 70 (with a percentage sign icon) 與 (And) 50 (with a percentage sign icon) → 2
- Rule 3: 除此以外 (Except) → 3

At the bottom of the dialog, there is a "+ 添加" (Add) button, a dropdown menu set to "全選所有規則" (Select all rules), a checkbox for "重建資訊佇列" (Rebuild message queue), and a radio button for "有效" (Valid).

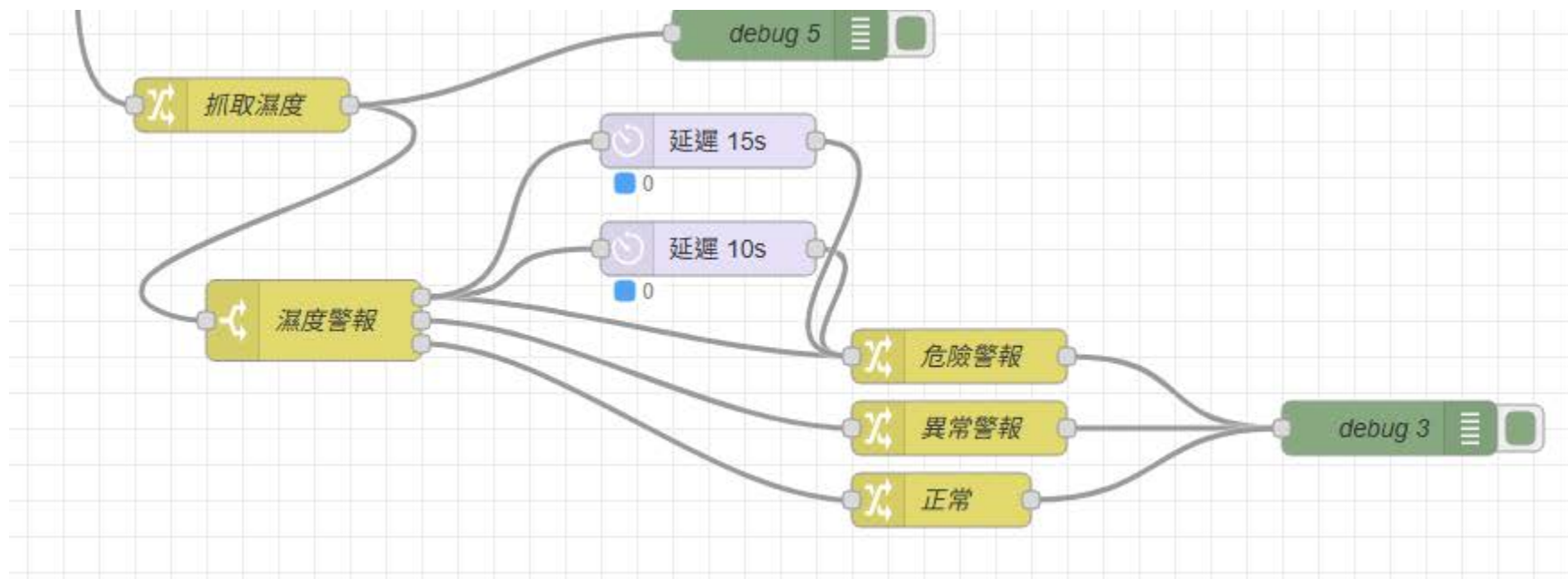
實際運作



```
2026/4/12 上午10:39:24 node: debug 1  
msg.payload : Object  
  ▶ { temp: 32, humi: 30, light: 450 }  
2026/4/12 上午10:39:24 node: debug 2  
msg.payload : number  
32  
2026/4/12 上午10:39:24 node: debug 5  
msg.payload : number  
30  
2026/4/12 上午10:39:24 node: debug 4  
msg.payload : number  
89  
2026/4/12 上午10:39:24 node: debug 3  
msg.payload : string[6]  
"濕度安全範圍"
```

DELAY延遲

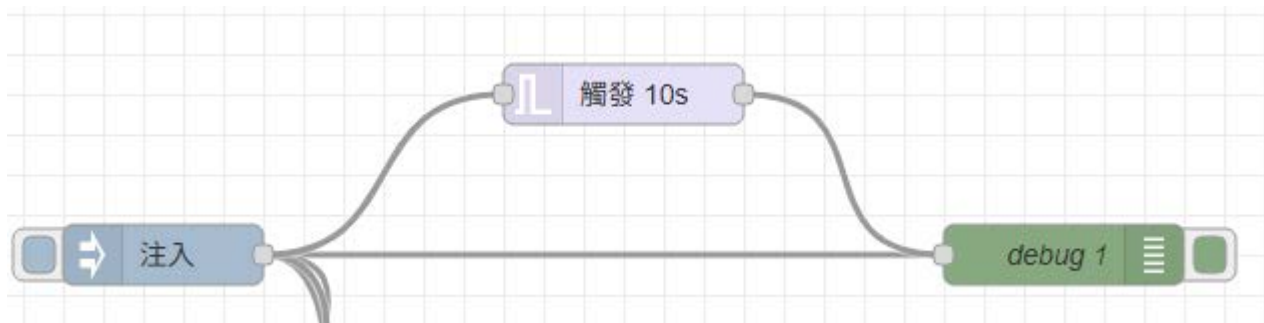
delay：延遲發送訊息，可以用來延遲重複發送。



```
2026/4/12 上午11:16:50 node: debug 4  
msg.payload: number  
89  
2026/4/12 上午11:16:50 node: debug 3  
msg.payload: string[4]  
"濕度超標"  
2026/4/12 上午11:17:00 node: debug 3  
msg.payload: string[4]  
"濕度超標"  
2026/4/12 上午11:17:05 node: debug 3  
msg.payload: string[4]  
"濕度超標"
```

TRIGGER

trigger : 當**沒有資料**進來時發送訊息。



除錯窗口

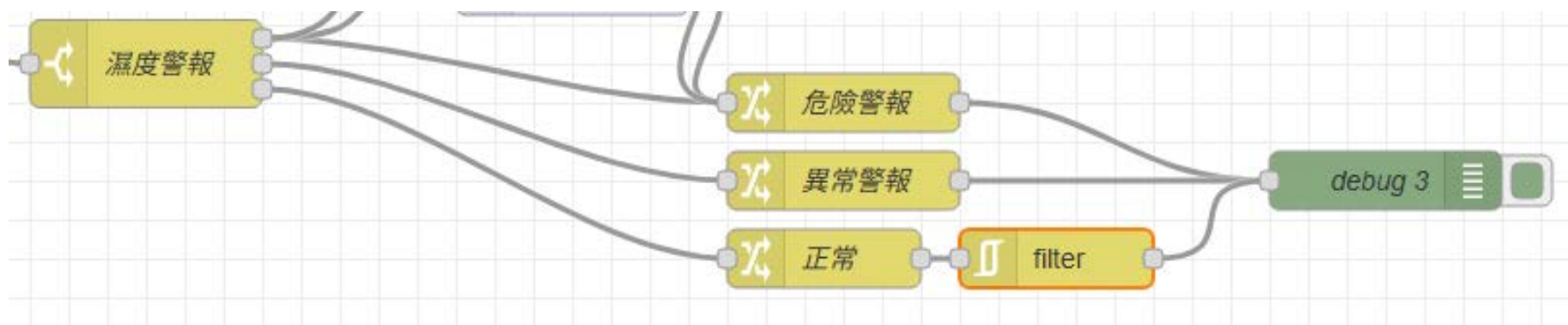
所有節點

all

2026/4/12 上午11:52:35	node: debug 4	msg.payload : number	89
2026/4/12 上午11:52:35	node: debug 3	msg.payload : string[6]	"濕度安全範圍"
2026/4/12 上午11:52:45	node: debug 1	msg.payload : string[8]	"無資料傳入請檢查"
2026/4/12 上午11:53:23	node: debug 1	msg.payload : Object	{ temp: 32, humi: 20, light: 450 }
2026/4/12 上午11:53:23	node: debug 2	msg.payload : number	32
2026/4/12 上午11:53:23	node: debug 5	msg.payload : number	20
2026/4/12 上午11:53:23	node: debug 1	msg.payload : string[1]	"1"
2026/4/12 上午11:53:23	node: debug 4	msg.payload : number	89

FILTER過濾器

filter：當資料都一樣時停止，直到出現變化才執行。



安裝 GOOGLE GEMINI 節點

搜尋節點 node-red-contrib-gemini

The screenshot shows the Node-RED interface with the '節點' (Nodes) tab selected. The search bar contains 'node-red-contrib-gemini'. The search results show a node named 'node-red-contrib-gemini' with a description: 'Node-RED nodes for Google Gemini AI integration including text generation, chat, vision, image generation, speech generation, and audio understanding capabilities'. The version is 1.0.3, published 4 months ago, and has 47 likes. The '安裝' (Install) button is highlighted with a red box.

The screenshot shows the Node-RED keyboard shortcuts menu. The '節點管理' (Node Management) shortcut, which is 'alt-↑', is highlighted with a red box. A red arrow points from this box to the '安裝' (Install) button in the previous screenshot.

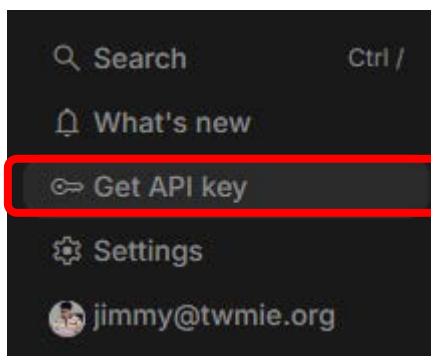
- 編輯
- 顯示
- 布局
- 匯入 `ctrl-i`
- 匯出 `ctrl-e`
- 搜尋流程 `ctrl-f`
- 修改節點配置 `ctrl-g c`
- 流程
- 子流程
- 組
- 節點管理 `alt-↑`**
- 設置 `ctrl-,`
- 鍵盤快速鍵 `↑?`
- Node-RED 文檔主頁
- v4.1.8

取得 GOOGLE GEMINI API KEY

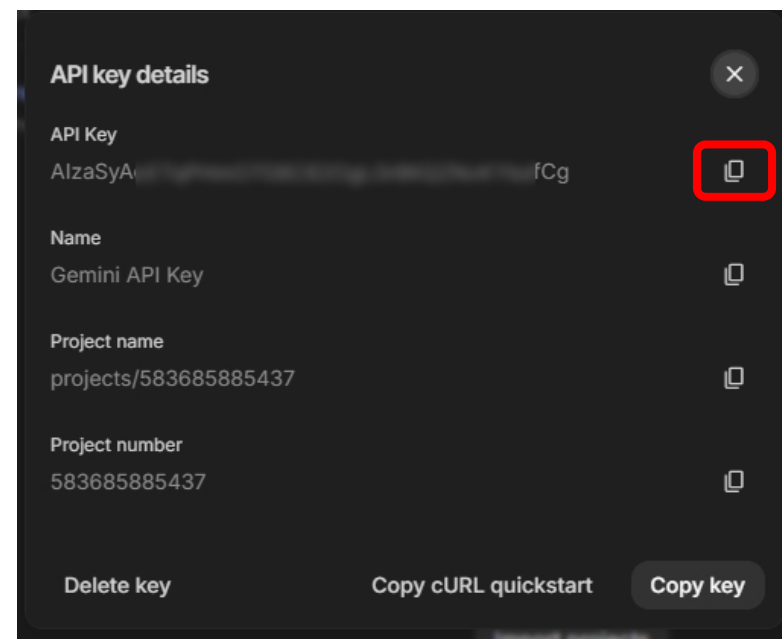
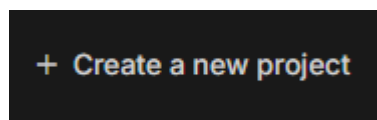
- 開啟瀏覽器，前往 Google AI Studio。

<https://aistudio.google.com/>

- 找到



- 新增



添加AI KEY

刪除 取消 完成

屬性

Basic Configuration

Name 數據分析

API Key * Gemini API Key

Model * gemini-2.5-flash (saved)

Model Reference

Text & Chat Models:
View all available text generation models

Vision Models:
Multimodal models for image/video analysis

Available Models:
Check the official documentation for current model availability

Input Configuration

Mode Single Turn

Prompt
(required when set
to 'string')

有效

編輯 gemini-generate-content 節點 > 添加新的 gemini-api-key 配置

取消 添加

屬性

Name Optional name for this API key

API Key

How to get your API key:

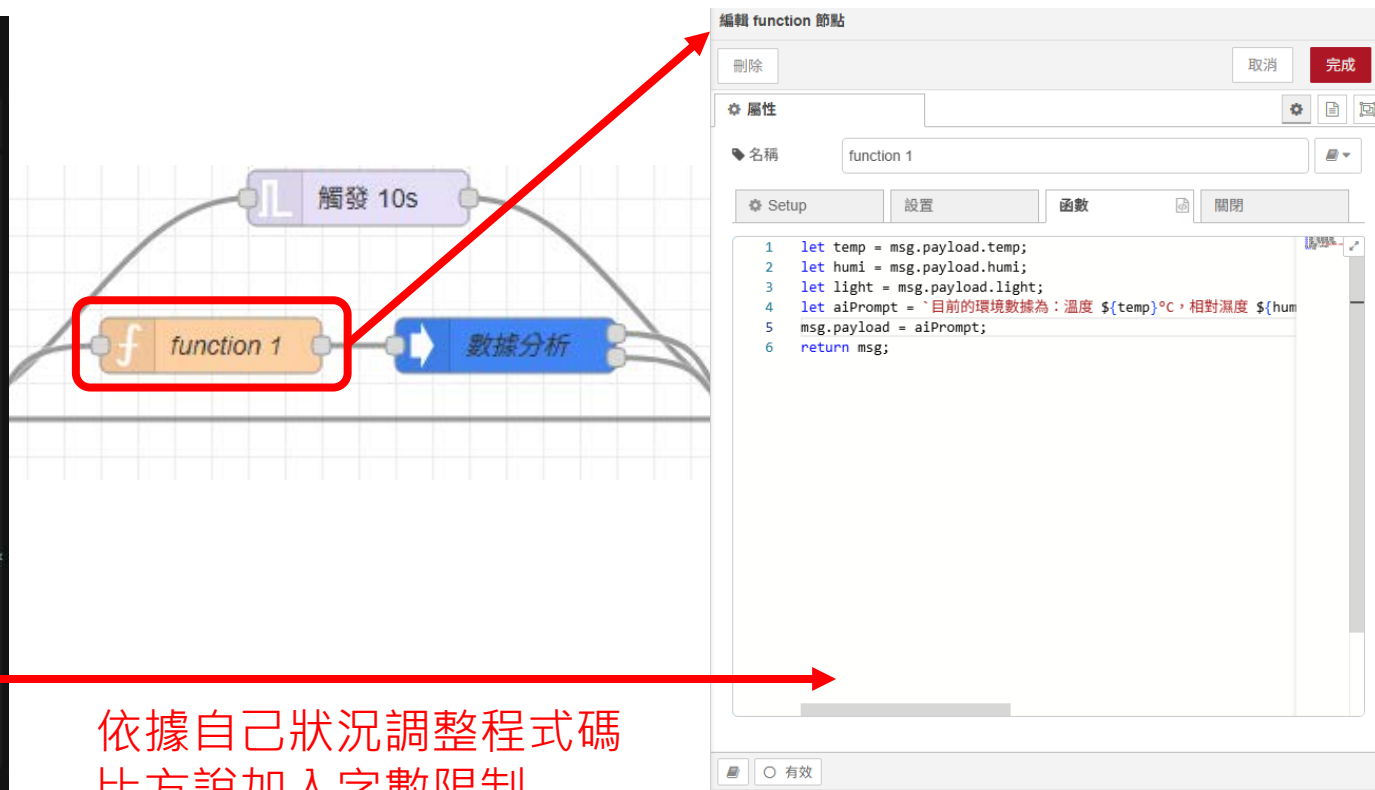
1. Visit [Google AI Studio](#)
2. Sign in with your Google account
3. Click "Create API Key"
4. Copy the generated API key and paste it above

Security: Your API key is stored securely and encrypted by Node-RED.

透過 GEMINI AI 幫你寫程式

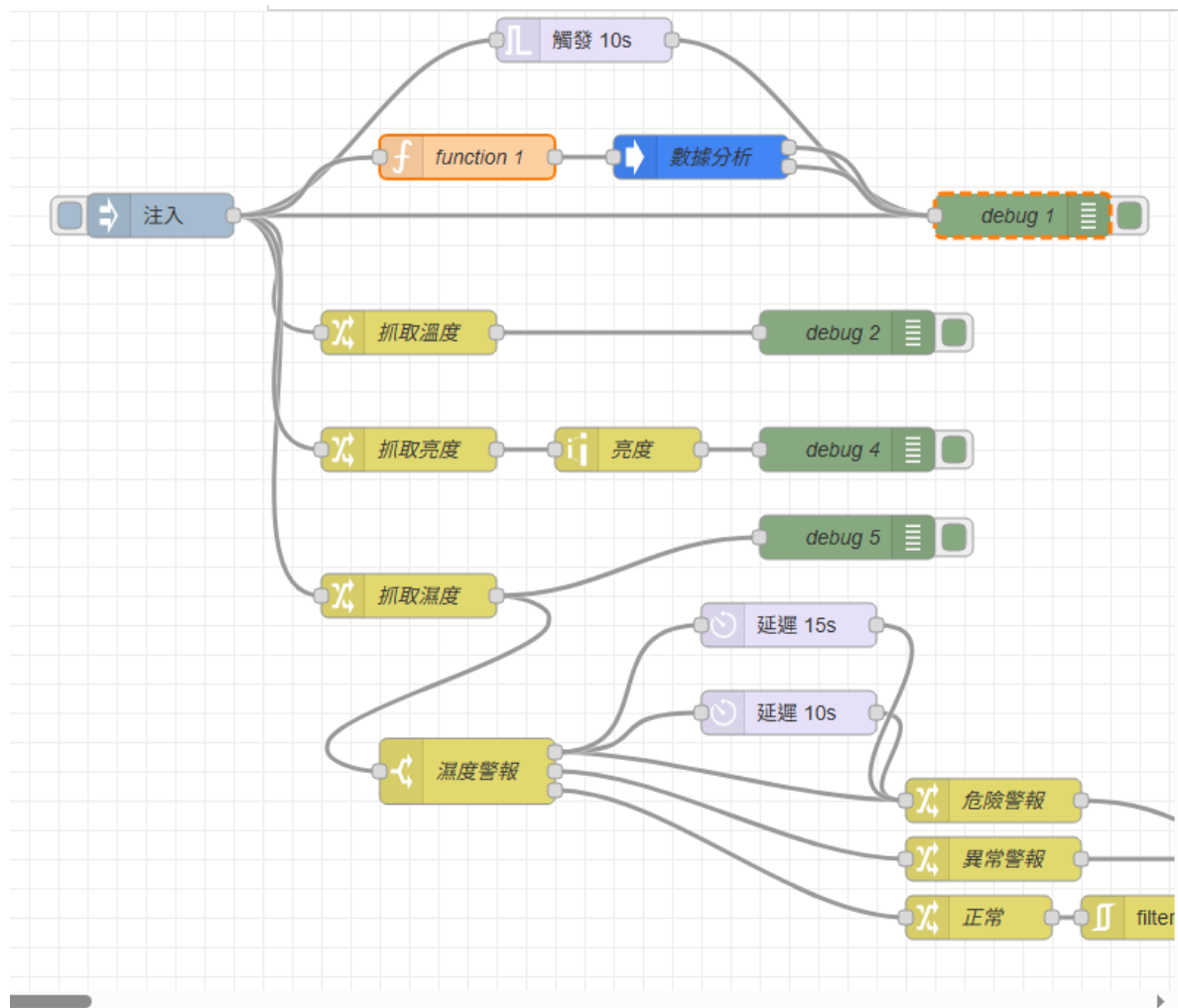
使用 Node-RED 進行 gemini AI 資料分析，我的資料為 {"temp":32, "humi":50, "light":650} 分別代表溫度、濕度及亮度。(已安裝 node-red-contrib-gemini)

```
個 Function 節點，將收到的 JSON 轉換成 AI 容易讀取的格式：  
  
JavaScript  
  
// 從 msg.payload 取得原始感測器資料  
let temp = msg.payload.temp;  
let humi = msg.payload.humi;  
let light = msg.payload.light;  
  
// -----  
// 情況 A：如果你要餵給傳統機器學習模型（如 TensorFlow）  
// 模型通常需要一維陣列（Array）作為特徵值（Features）  
let mlFeatures = [temp, humi, light];  
  
// -----  
// 情況 B：如果你要餵給生成式 AI 或大型語言模型（LLM）  
// 將數據轉換成自然語言的提示詞（Prompt）  
let aiPrompt = `目前的環境數據為：溫度 ${temp}°C，相對濕度 ${humi}%，亮度 ${light} lux`;  
  
// 將轉換後的資料覆蓋原本的 payload，傳遞給下一個節點  
//（請根據你的需求選擇輸出 mlFeatures 或 aiPrompt）  
msg.payload = aiPrompt;  
  
return msg;
```



依據自己狀況調整程式碼
比方說加入字數限制

依據資料透過AI分析結果



所有節點 all

環境舒適度評估：

目前的環境舒適度 ****非常低，處於極度不適的狀態****。主要問題是**高溫**和**極低的濕度**。

- **溫度 (32°C): 極度高溫****
 - **評估:**** 32°C 遠高於一般室內舒適溫度範圍 (通常為 22-26°C)。長時間處於此溫度會讓人感到酷熱、煩躁、出汗，甚至可能導致中暑或熱衰竭。這會嚴重影響工作效率和身心健康。
- **相對濕度 (20%): 極度乾燥****
 - **評估:**** 20% 的相對濕度遠低於人體舒適範圍 (通常為 40-60%)。空氣過於乾燥會導致以下問題：
 - 皮膚乾燥、發癢
 - 眼睛乾澀、不適
 - 喉嚨乾燥、咳嗽，容易引發呼吸道疾病
 - 靜電問題
 - 對木質家具和樂器等物品可能造成損害
- **亮度 (450 lux): 一般，可能稍嫌不足或合適****
 - **評估:**** 450 lux 對於一般辦公或日常活動來說，處於一個可接受但可能不算最理想的範圍。
 - **足夠:**** 對於一般休息或輕鬆活動來說，亮度足夠。
 - **稍嫌不足:**** 如果需要進行閱讀、寫作或使用電腦等需要高度專注的精細工作，450 lux 可能會稍嫌不足，容易造成眼睛疲勞。
 - 在如此高溫和乾燥的環境下，亮度的問題相對次要，但仍值得關注。

綜合評估：

目前的環境組合對人體健康和舒適度是極其不利的。高溫會使人感到悶熱難耐，而極度乾燥的空氣則會加劇不適，導致身體水分流失和各種乾燥症狀。這種環境會大大降低居住者或工作者的舒適度、生產力，並可能帶來健康風險。

建議：

務必立即採取措施改善環境條件。

- **針對高溫 (32°C):****
 - **立即開啟空調 (Air Conditioning):**** 將溫度設定在 24-26°C 的舒適範圍。
 - **使用風扇 (Fans):**** ...

啟用 Windows 移至 [設定] 以啟用 Windows。