AI Experiment Box:

1. **Aluminum Alloy Structure & All-in-One Design**: The box is made of aluminum alloy with an all-in-one design, and includes a keyboard, mouse, power adapter, and experimental teaching tools, supporting plug-and-play functionality.
2. **17-inch Screen**: The screen has a resolution of 1920×1080 and uses an IPS hard screen.
3. **Integrated Panel**: The installation panel integrates a robotic arm, 2D vision system, depth vision system, 2-DOF electric gimbal, voice module, embedded sensors, and other components to meet the teaching requirements of multiple courses.
4. **Computation Unit Configuration and Requirements**:
   (1) **Hardware Performance**:
   - CPU: 6-core NVIDIA Carmel ARM v8.264 bit
   - Memory: 8GB
   - Storage: 128GB SSD
   - GPU: NVIDIA Volta architecture, 384 NVIDIA CUDA cores, 48 Tensor cores
   - Video Memory: 8GB 128-bit LPDDR4x, 51.2GB/s bandwidth
   - Connectivity: Gigabit Ethernet
   - Display: HDMI and DP

(2) The device comes pre-installed with Python 3.5 and the experiment code runs in the Jupyter Notebook environment, facilitating teaching.

(3) Built-in AI algorithm library includes object classification recognition, target detection, facial recognition, and speech processing, meeting the needs for basic application and development teaching.

(4) Deploys YOLOv5 target detection and instance segmentation models accelerated by TensorRT.

5. **2D Vision System**:
   - Resolution: 640×480
   - Frame rate: 30fps
   - Focus: Manual focus
   - Mount: Bracket-style, foldable for storage.
6. **Depth Camera**:
   - Depth stream output resolution: 640×400
   - Depth stream output frame rate: 30fps
   - RGB sensor resolution: 1920×1080
   - RGB sensor frame rate: 30fps
7. **2-DOF Gimbal**: Electric control with dual servo motors, software-controlled posture.
8. **Depth Camera on Gimbal**: The depth camera mounted on the 2-DOF gimbal can rotate ±90° and pitch 110°, supporting experiments like facial recognition and dynamic object tracking.
9. **Image Recognition Functions**:
   (1) **Face Keypoint Detection**: Precisely locates 14 key points, including the cheeks, eyebrows, eyes, mouth, and nose, as well as facial contours.
   (2) **Pedestrian Detection**: Detects and marks passing pedestrians, supporting multi-person detection.
   (3) **Hand Gesture Recognition**: Recognizes various hand gestures and directions, accurately locating five key points on the hand, supporting gestures like V-sign, thumbs up, five-finger, and fist.
   (4) **Facial Feature Extraction**: Quickly extracts facial feature information for system registration.
10. **Microphone Array**: 360° surround sound pickup, open function interface for custom voice commands.
11. **Robotic Arm**:
    - Effective Grasp Range: 15cm radius

- Degrees of Freedom: 5 DOF plus a gripping arm
- End-Effector: Two-finger gripper

12. **Robotic Arm Kinematics**: Provides forward kinematics algorithms and open-source code to support learning of joint control principles.
13. **One-Button Control for Robotic Arm**: The installation panel provides a one-touch start and reset button to lift and return the robotic arm to storage position for easy teaching.
14. **Voice Control for Robotic Arm**: Supports voice commands to control the robotic arm's actions, such as moving up, down, left, or right.
15. **Visualization Control Software**:
    (1) The software includes robotic arm teaching and motion control features, such as start/stop control, enable control, drag teaching, movement control, and coordinate recording.
    (2) The software includes digital image acquisition and processing, including real-time collection and display of 2D and depth images.
    (3) The software includes visual modeling capabilities, such as target detection, instance segmentation, and image classification.
    (4) The software includes collaborative control between the robotic arm and vision system for tasks like fruit picking, digital sorting, target classification, and object stacking.
16. **Embedded Sensor Modules**:
    (1) Ultrasonic sensor: Suitable for distance measurement experiments.
    (2) Human detection sensor: Suitable for detecting human presence or motion.
    (3) Temperature and humidity sensor: Suitable for environmental sensing experiments.
    (4) Heart rate sensor: Suitable for heart rate detection experiments.
    (5) Pressure sensor: Suitable for atmospheric pressure measurement and weather monitoring experiments.
    (6) Digital tube: Suitable for OLED display experiments, such as displaying traffic countdowns.
    (7) Bluetooth module: Suitable for Bluetooth communication experiments.
    (8) Gyroscope: Suitable for attitude-based motion control and posture detection.
    (9) Sound sensor: Suitable for noise detection experiments.
    (10) Light sensor: Suitable for measuring light intensity in environmental lighting experiments.
    (11) Flame sensor: Suitable for flame detection experiments.
    (12) Gas sensor: Suitable for air quality detection experiments.
    (13) Fan: Configured with a physical knob for PWM-controlled fan speed adjustment.

(14) OLED screen: Used for displaying sensor data and selecting corresponding experiments.
(15) Indicator lights: For status indication, such as power, operation status, or error signals.
(16) Buttons: At least 4 buttons for selecting experiments or resetting the microcontroller.
(17) Microcontroller: Manages sensor data, executes instructions, and interacts with other modules.
(18) All sensors feature fool-proof designs to prevent misconnection, simplify operations, and improve safety and reliability.

17. **Voice Control for Sensors**: Supports controlling sensors and the robotic arm through voice commands for actions such as object grabbing, turning on/off lights, adjusting fan speed, and temperature detection.
18. **Open Software Framework and Algorithm Source Code**: Full software framework and algorithm source code are open for secondary development. The device comes with comprehensive experiment manuals and technical documentation upon delivery.