Welcome to Session By Technical Education and Skilling on
Empowering Bengal: Nurturing Future Ready Skills For A High Precision Work Force

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Anupam Bhattacharjee is the Senior Vice President at Tata Technologies, a seasoned business leader, and a global thought leader in Electric Mobility, Connected Vehicles, and Software-Defined Vehicles. With over two decades of international experience across the US, Germany, France, Japan, and India, he has held leadership roles at Wipro Technologies, Mahindra & Mahindra, and Tata Motors Ltd.

An alumnus of Jadavpur University and the Loyola Institute of Business Administration, Anupam is currently pursuing a PhD in Electric Vehicle Adoption from IIM Ranchi. He is a United Nations speaker, a published writer, and actively contributes to the startup ecosystem by incubating ventures in autonomous navigation at IIT Hyderabad.

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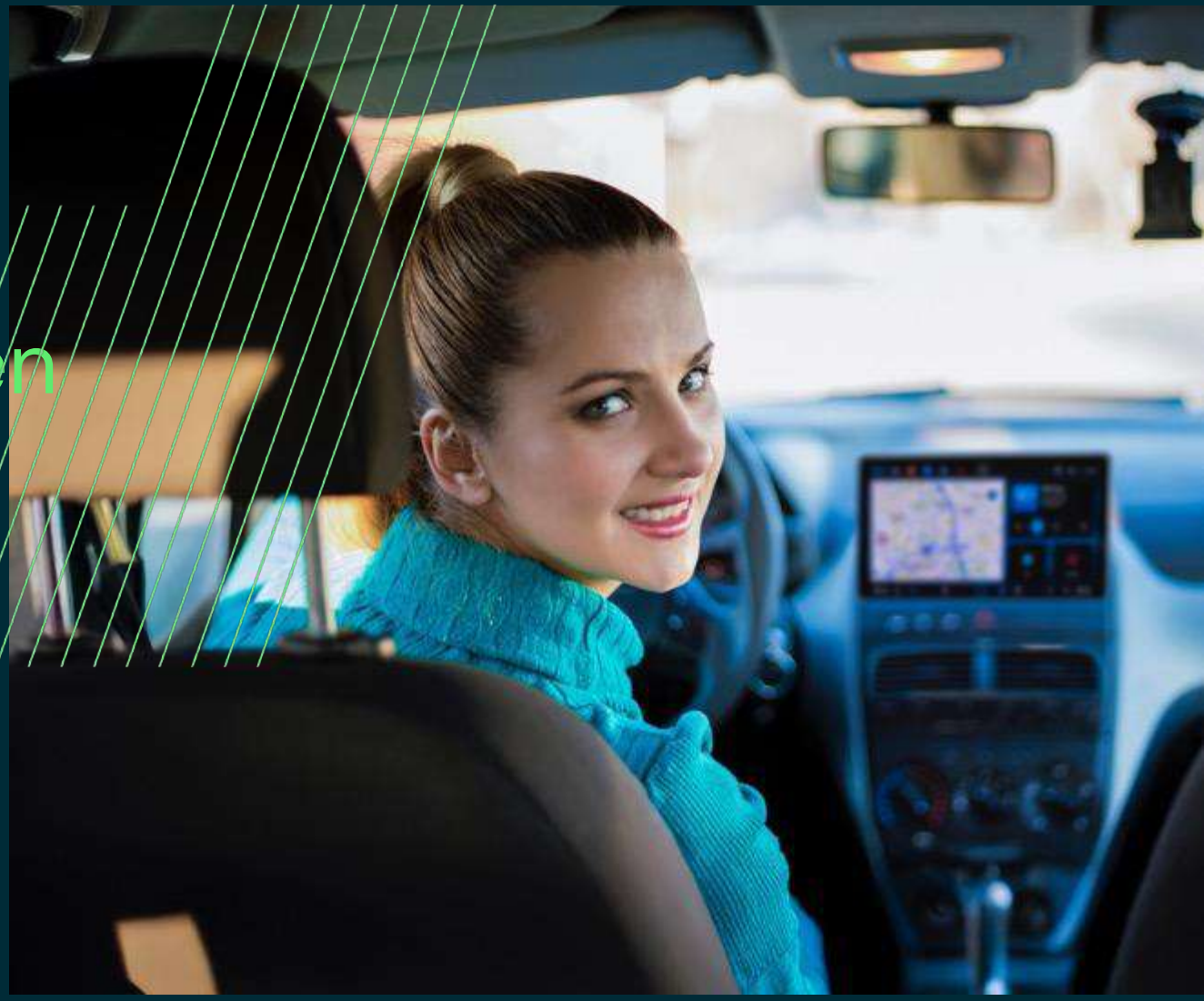
Manufacturing for Next-Gen Technologies

EVs, Drones, Robotics, and Semiconductors



By Anupam Bhattacharjee

6th April, 2025, Kolkata

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Case Study 1 – Automotive – EV

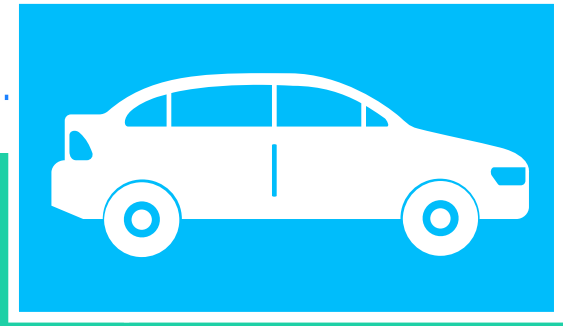
EV Ecosystem Manufacturing Opportunities

EV Battery Service & Second-life Applications
Battery pack servicing – Recycling for the 2nd life

R&D and Innovation Centers
AI-driven BMS, and smart charging solutions – Startup incubation & Proto manufacturing

Charging Infrastructure Manufacturing
charging stations, grid-connected chargers, and solar-integrated chargers, battery swapping technology

EV Assembly & OEMs
Two-wheeler & Three-wheeler Evs - E-buses & Commercial EVs - Retro fitment of ICE Vehicles



EV Component Manufacturing
Battery Packs & Cells - Motors & Power Electronics - EV Plastics & Body Parts

Recommended Skill Development Plan for WB

In line with China, US, Germany, Japan

🚀 **Phase 1: Short-Term (6-12 Months)**

- Set up EV Skill Training Labs in **Polytechnic & ITI colleges**
- Develop EV **Safety & Battery Handling Certification** Programs for mechanics.
- Launch Online **EV Software & AI Bootcamps** in partnership with Engineering Institutes & Nasscom.

🚀 **Phase 2: Mid-Term (1-3 Years)**

- **EV Innovation Hub** in Kolkata, supporting startups in AI, battery recycling & V2G.
- **Collaborate with Global EV OEMs** to set up a Public-Private EV Training Academy.
- Expand **EV Charging Technician Training** across urban & rural regions.

🚀 **Phase 3: Long-Term (3-5 Years)**

- Establish an **Advanced EV Research & Manufacturing** Center
- Train 1,00,000+ workforce in EV assembly, energy storage & charging infra management.
- Make WB a leader in EV exports by skilling MSMEs in EV component manufacturing.

Case Study 2 – Drones

Drone Ecosystem Manufacturing Opportunities

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Drone Component Manufacturing

Airframe Manufacturing – Propulsion Systems – Battery & Energy Storage –Flight Control Systems (FCS) - Camera & Imaging

Drone Assembly

Agricultural Drones – Logistics & Delivery Drones – Surveillance & Defense Drones – Urban Planning & Infrastructure Drones – Marine Drones

Drone Software & AI Development

Autonomous Flight Control – Computer Vision & AI Processing – Edge Computing & Cloud Integration – 5G - Cybersecurity & Anti-Drone Tech – Digital Twin & Simulation Models

Drone Testing & Certification Centers

For commercial & military-grade drones. BVLOS (Beyond Visual Line of Sight) Testing – High-Altitude & Weather Simulation Labs – Marine & Coastal Drone Testing

Recommended Skill Development Plan for WB

- **Establish a Drone Skill Development & Training Academy**
  Train a workforce in drone manufacturing, piloting, software dev, and AI-based analytics.
  Proposed Curriculum:
  Drone Fundamentals – Drone Assembly & Maintenance – Flight Training & BVLOS Certification – AI & Data Processing for Drones – Drone Business & Entrepreneurship

- **Public-Private Partnerships for Drone Skilling** (Industry-funded certification programs)
  OEMs (Original Equipment Manufacturers): DJI, IdeaForge, Skylark Drones.
  Tech Firms: Google (Wing), Amazon (Prime Air), Microsoft AI for Drones.
  Academia & Research: IIT Kharagpur, Jadavpur University, IIM Calcutta.
  Startups & Incubators: Support drone tech startups through WB Govt Startup Initiatives.

- **Integrate Drones in Agriculture, Logistics & Security**
  Agriculture: Malda, Bankura, Purulia (Precision farming, pesticide spraying).
  Logistics: Kolkata, Howrah, Haldia (E-commerce & medical delivery drones).
  Security: Sundarbans, North Bengal (Border surveillance, disaster relief).

Case Study 3 – Robotics

Robotics Ecosystem Manufacturing Opportunities

AI & Service Robots for Healthcare

Medical Assistance Robots –surgeries/ diagnostic , **Elderly Care** Robots, **Pharmaceutical Automation** Robots: labs, drug manufacturing

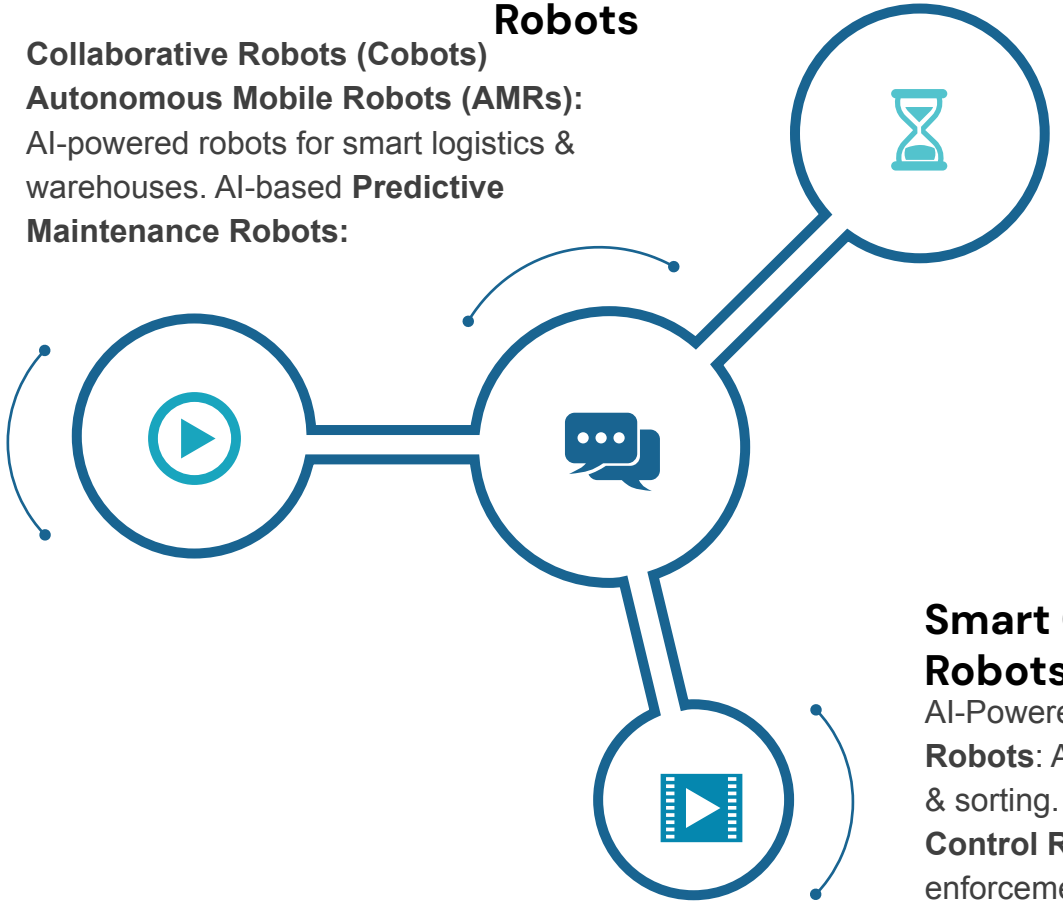
AGIBOT

XPENG ROBOTICS

UBTECH

Industrial & Automation Robots

Collaborative Robots (Cobots)
Autonomous Mobile Robots (AMRs): AI-powered robots for smart logistics & warehouses. AI-based **Predictive Maintenance Robots:**



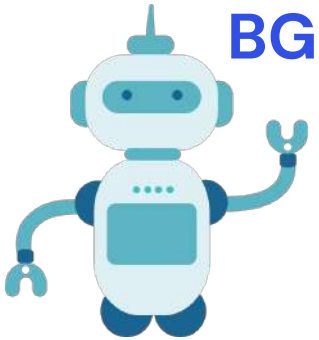
Robotics in Agriculture & Food Processing

Agri-Drones & Autonomous Tractors: For precision farming. AI-based **Harvesting Robots**: Automated machines for crop collection & sorting. **Cold Chain & Food Processing Robots**: Used for sorting, packaging, and food safety

Smart City & Urban Service Robots

AI-Powered **Waste Management Robots**: Autonomous garbage collection & sorting. **Public Security & Traffic Control Robots**: AI-driven monitoring & enforcement systems. **Autonomous Delivery Robots**: Last-mile e-commerce

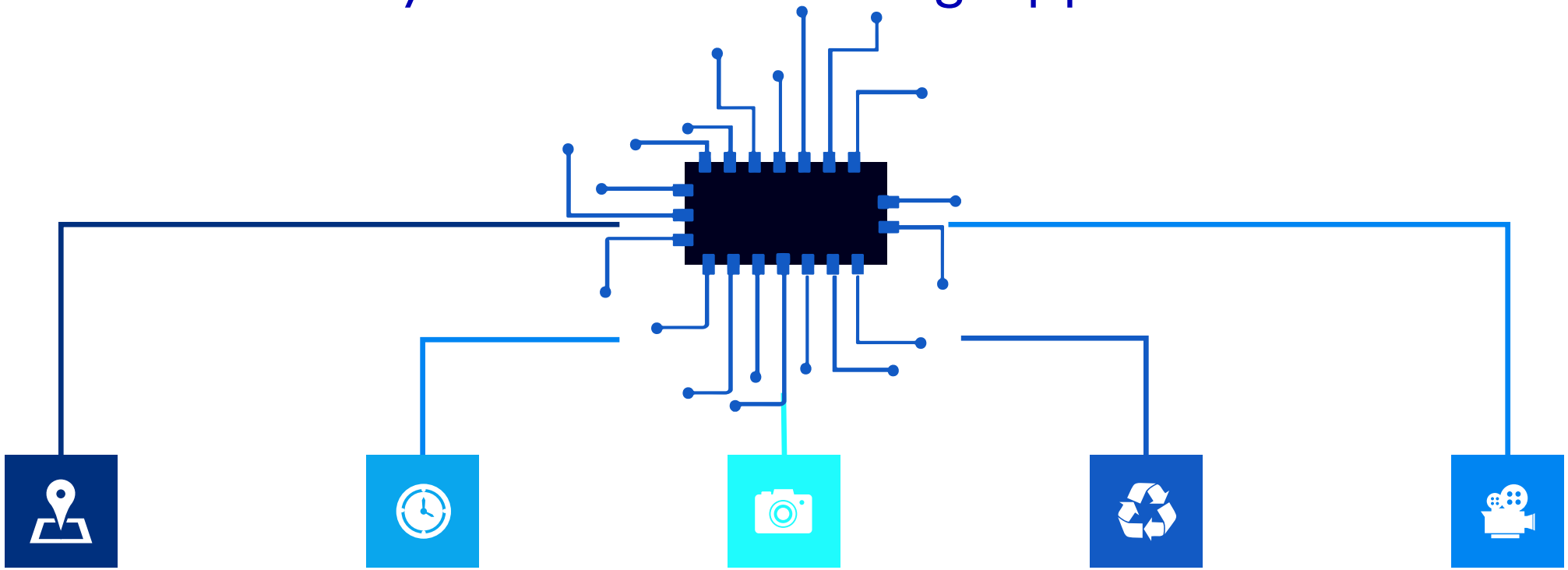
Recommended Skill Development Plan for WB



- Launch the **Skill Development Mission**
  Short-term certifications, Diplomas
- Set up Robotics Training Institutes
  Industrial Robotics – Programming, assembly, automation, predictive maintenance, **AI & Machine Learning for Robotics** – Computer vision, motion planning, sensor integration
- Partner with Industry Leaders for AI-Driven Robotics Workforce Training.
  ABB, Fanuc, KUKA, Boston Dynamics for industrial robotics. **AI startups (NVIDIA, DeepMind, OpenAI)** for smart automation. **Automotive & electronics companies (Tata, Bosch, Siemens)** for robotics adoption.
- Integrate **Robotics Courses** in Colleges
- Provide MSME & **Startup Incentives** for Robotics Entrepreneurs.
- Develop a **Robotics Policy** to Position WB as India's AI & Automation Hub.

Case Study 4 – Semiconductors

Semiconductor Ecosystem Manufacturing Opportunities



Semiconductor Fabrication (Fab) Units

Wafer Fabrication, Analog & Mixed-Signal Semiconductor Manufacturing, Power Semiconductors

Semiconductor Packaging & Testing

Chip Assembly & Packaging, Wafer Dicing & Bumping Facilities, Testing Labs for Automotive, Consumer Electronics & IoT Chips

Compound Semiconductors & Power Electronics

GaN (Gallium Nitride)-based Power Chips for EV Fast Chargers, SiC (Silicon Carbide) MOSFETs for Industrial & Aerospace Applications etc.

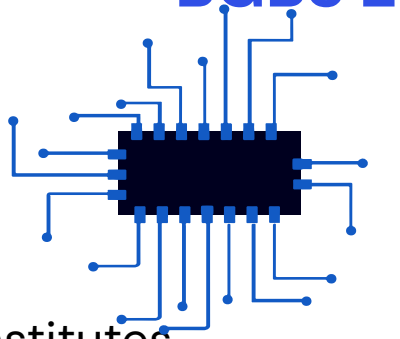
Display & Micro LED Manufacturing

OLED & AMOLED Panel Production for Mobile & Consumer Electronics, MicroLED & MiniLED Factories for TVs & Smartwatches, Flexible Displays for Wearables & Automotive Screens

AI & Edge Computing Chips for Smart Devices

AI Accelerators for Edge Computing & IoT, Custom AI Chips for Smart Cameras, Robotics & Industrial Automation

Recommended Skill Development Plan for WB



Establish **Semiconductor Skill Training** Centers

- Set up VLSI & Chip Design Training Labs at engineering colleges.
- Launch Fab Technician & Cleanroom Training Programs at ITIs & Polytechnic Institutes.

Industry-Academia Collaboration

- Partner for industry-led training.

Develop Specialized **Semiconductor Courses**

- Chip Design (VLSI, ASIC, FPGA, AI Chips) at engineering colleges.
- Semiconductor **Fabrication & Process** Engineering at diploma & degree levels.

Semiconductor Workforce **Upskilling & Reskilling**

- **Bootcamps & certifications**

Semiconductor **Talent Pipeline** Development

- “Semiconductor **Fellowship Program**” for PhD & M.Tech students.
- Set up a Semiconductor **Startup Incubation** Fund for new ventures in chip design.

Advantage Bengal

- Strategic Location & Industrial Hubs
- Talent & R&D Strength in West Bengal
- Cost Advantage & Business-Friendly Ecosystem
- Huge local market potential (Direct & Indirect)
- Strong MSME ecosystem
- Huge growth potential

Recap – What do we do at West Bengal to Embrace Future Skill Demands in High-Tech industries

- Modernize Skill Training Centers – Collage Infra & Course Content (ITI, Diploma & Engineering)
- Industry Academia Collaboration
- Bootcamp & Certifications
- Startup Incubation
- Integrate usage of High Tech in the targeted areas e.g. Agriculture, security etc.
- State Policy & Skill Development Mission to Drive the Growth of High-Tech Industries

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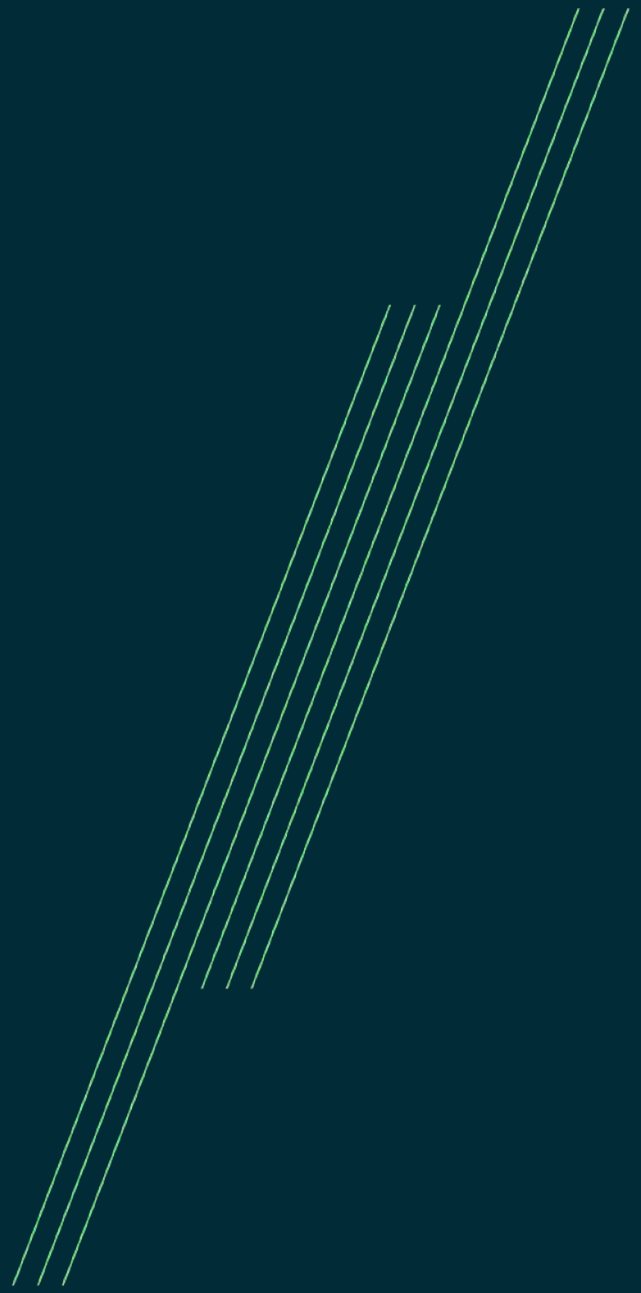

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