The AI Fit & Fabric Lab

Architecting Computational Couture

The AI Fit & Fabric Lab is envisioned as a strategic asset for modern luxury couture houses. By integrating advanced engineering simulations with high-fashion artistry, the Lab elevates the brand from traditional craftsmanship to **Computational Couture**.

Executive Summary

Every heavy bridal lehenga, structured gown, or sculptural drape is not only aesthetically transcendent but structurally validated and precisely fitted to the client's unique anatomy.

Core Capabilities

The Physics of Luxury

The Lab operates at the intersection of material science, simulation engineering, and couture artistry, using a proprietary Computational Fabric Repository to digitally replicate the real world with exceptional fidelity.

High-Fidelity 3D Drape Simulation

We move beyond standard rendering into **physics-based drape modelling**.

Using custom 3D physics material presets (instead of U3M), the Lab captures both optical and physical properties of indigenous textiles:

Fabric-Specific Physics

The system distinguishes the structured, high-volume drape of Banarasi brocade from the fluid fall of chiffon, crepe, or organza.

Shear Modulus Calibration

Essential for bias-cut silhouettes to ensure natural drape over the wearer's curvature without distortion.

Motion Dynamics & Real-Time Physics

Couture must move with grace. The Lab deploys **real-time cloth physics** to simulate garments in motion before any fabric is cut.

✔️ Kinetic Validation

Simulating movement of heavy lehengas, can-cans, and sweeping trails to ensure they flow elegantly during walking or dancing.

✔️ Fluidity Stress Tests

Ensuring veils, dupattas, and capes retain their intended shape during movement instead of collapsing or creasing unnaturally.

Structural Engineering: Embroidery & Weight Load

Heavy bridal wear requires **engineering precision**.

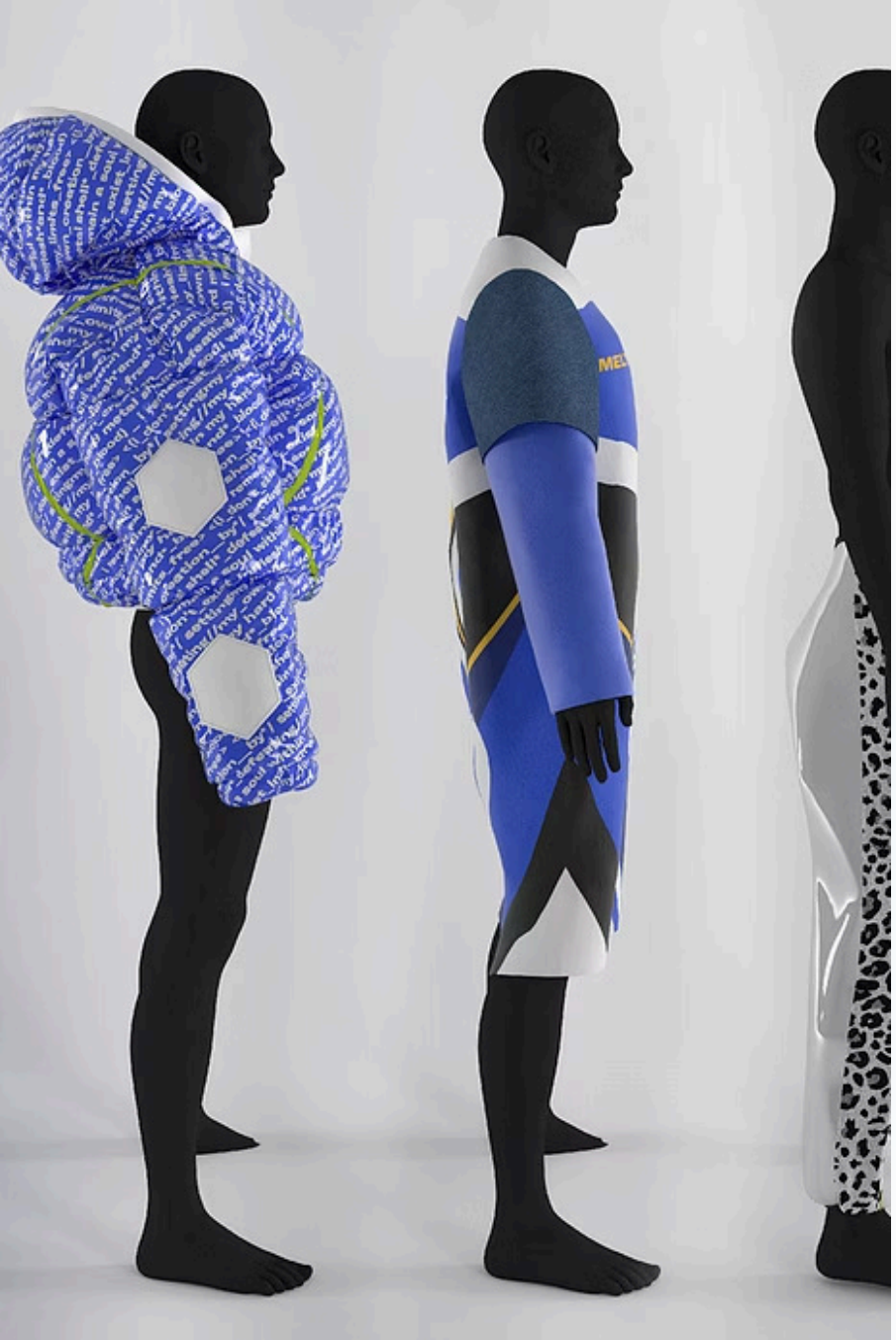
Using Finite Element Analysis (FEA) (aerospace-grade simulation), the Lab ensures the fabric's structural integrity under embroidery weight.

Embroidery Load Calculations

Predicting whether dense zardozi, crystals, or metallic work might cause tearing or sagging on delicate base fabrics like tulle or net.

Stress Distribution Heat Maps

Visual heat maps identify where embroidery weight places strain on the shoulders, waist, or skirt panels, enabling ergonomic correction before production.



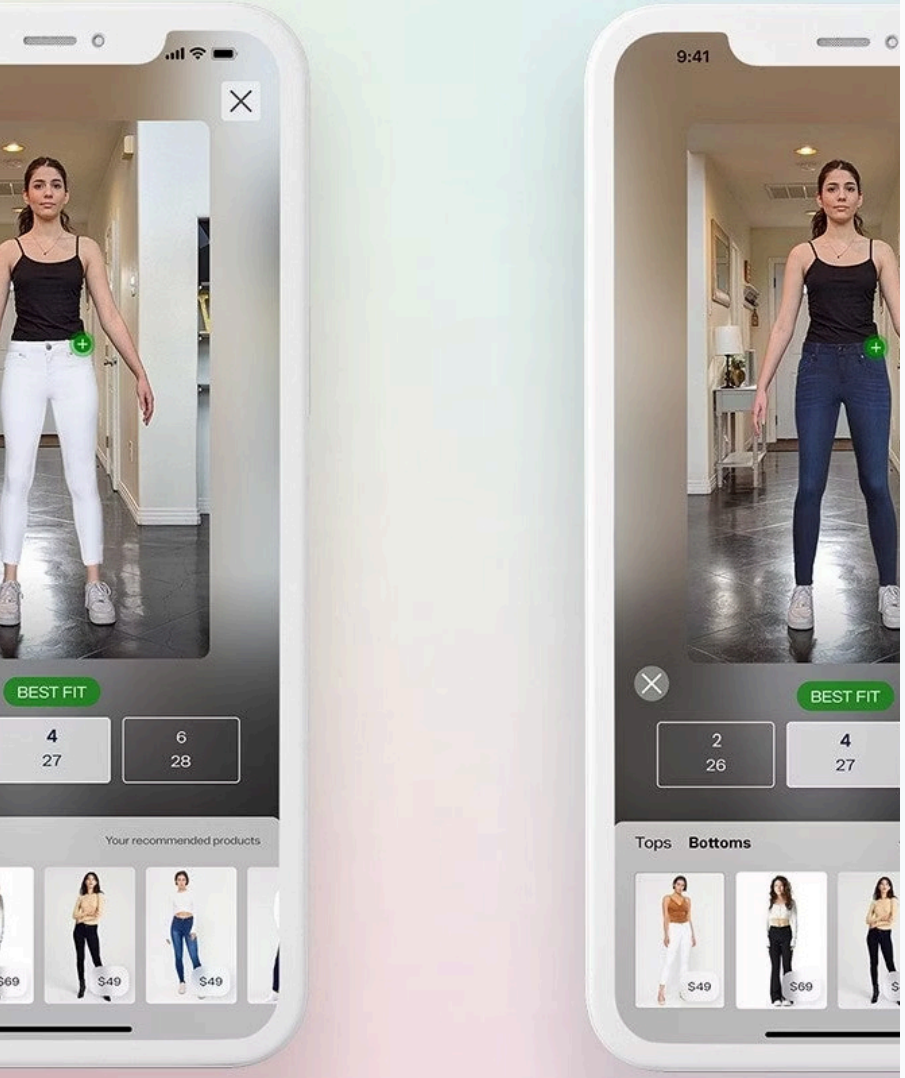
Generative Fabric Twins

Each textile is transformed into a **Digital Fabric Twin** through high-resolution scanning.

The twin captures:

- **Microscopic surface detail**
- **Weave topology**
- **Light reflection & sheen behaviour**

This allows clients to perceive the real texture of velvets, raw silks, organzas, and brocades virtually with near-physical accuracy.



Digital Avatar: Hyper-Precision Body Scanning

To serve NRI brides and global couture clients, the Lab uses **contactless 3D body scanning** via infrared or structured light.

✔️ 10-second Capture

Captures 250+ precise measurements.

✔️ Biometric Digital Twin

A photorealistic, riggable avatar matching posture, asymmetry, and volume distribution — replacing generic mannequins.

Workflow

The Virtual Atelier Pipeline

The Lab introduces a parallel digital workflow that precedes physical making.

The Virtual Atelier Pipeline

01

Phase 1 — Digitisation & Engineering

- Client body scan → Digital Avatar
- Fabric scanned → Physics Material File
- AI auto-grades pattern to match exact body topology

02

Phase 2 — Virtual Prototyping & Load Testing

- Virtual draping on client twin
- Silhouette & volume visualisation
- Full FEA load test to detect embroidery density risks
- Motion simulation to ensure fluidity and balance

03

Phase 3 — Fit Validation & Production

- FitMap heat analysis identifies tightness/looseness zones
- Final validated designs sent to atelier
- Reduces trial fittings + eliminates early-stage waste

Strategic Value

The Business of Perfection

Unlocking the Global Market

✔️ Remote Confidence

NRI brides gain confidence through accurate virtual try-ons using their digital twin.

✔️ Removal of Sizing Anxiety

Ensures near-perfect fit upon delivery, minimising alterations.

Sustainability & Waste Reduction

✔️ Zero-Waste Sampling

Virtual iterations cut physical sampling waste by 30–60%.

✔️ Material Optimisation

AI nesting tools reduce luxurious textile off-cuts.

Operational Velocity & Efficiency

- Faster prototyping for colourways, embroidery variations, silhouette adjustments
- Reduced development time
- Protects costly handwork by calculating load-bearing limits beforehand

---

Elevated Client Experience

✔️ Hyper-Personalised Service

Every interaction feels bespoke, guided by physics-backed couture precision.

✔️ Immersive Storytelling

Digital twins and AI analysis create cinematic lookbooks and personalised previews.

Computational Couture

Where Engineering Meets Artistry

The AI Fit & Fabric Lab transforms luxury fashion through precision, innovation, and uncompromising excellence.