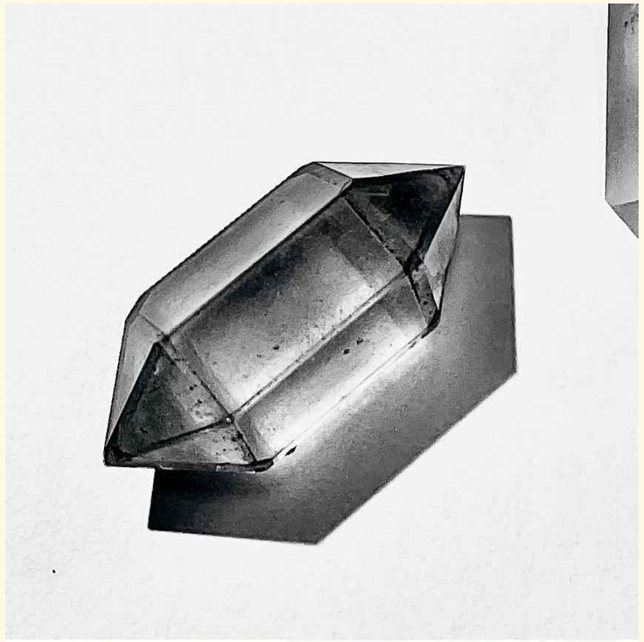
Insight · Lead · Create

Portfolio



Portfolio

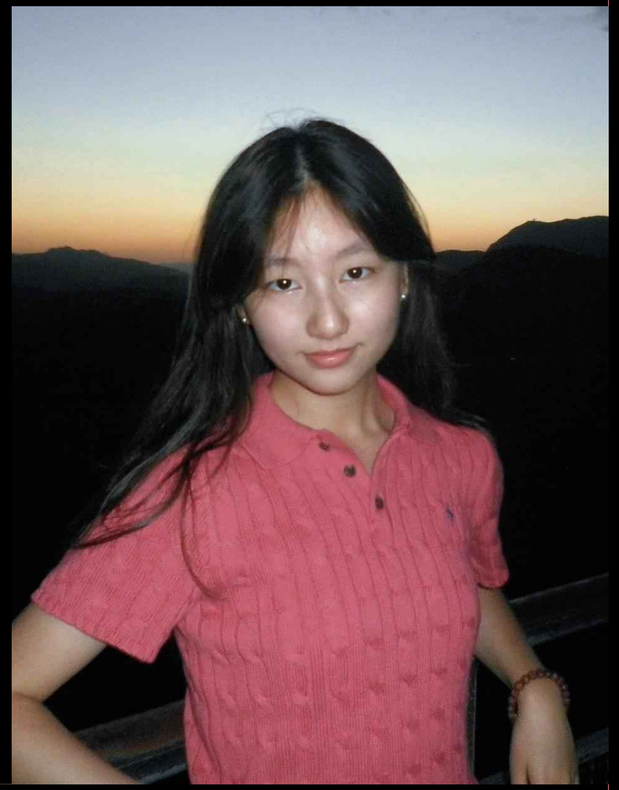
YUYAO HAN



English Name: Calista

Yuyao Han

MAY 31th, 2009



You may have noticed the crystal sketch on the cover.

Crystal is the nickname my parents gave me at birth.

A crystal does not generate light by itself. It catches what surrounds it, bends and refracts light, and sends it out in new directions.

This is how I see myself now: attentive to what surrounds me and gathering others to create value together.

This portfolio traces myjourney of making — across research, craft, business experiments and community gatherings.



1. ACADEMIC RESEARCH

2. CULTURAL HERITAGE

3. BUSINESS PRACTICE

4. COMMUNITY IMPACT

YUYAO HAN

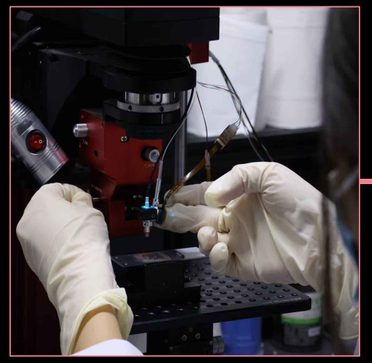


ACADEMIC RESEARCH

YUYAO HAN

Behavior Algorithms Prediction

> *This project marked my first step turning raw visual observation into measurable quantitative behavioural evidence.*



Lab two-photon equipment



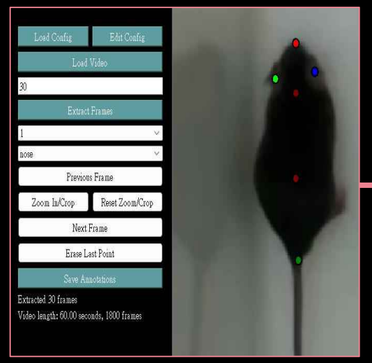
Mouse open-field test arena



Hands-on experimental setup



Raw mouse movement trace output



Ear-deflection feature annotation



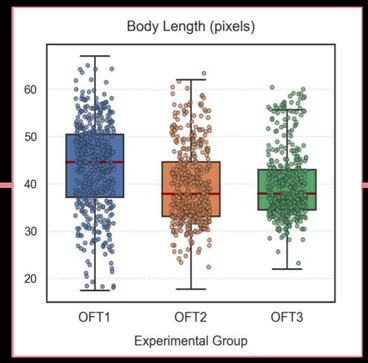
```
]
for col in coordinate_columns:
    data[col] = pd.to_numeric(data[col], errors

# 计算头部扭转角度
data['vector_nose_left_ear_x'] = data['sx_indiv
data['vector_nose_left_ear_y'] = data['sx_indiv
data['vector_nose_right_ear_x'] = data['sx_ind
data['vector_nose_right_ear_y'] = data['sx_ind

# 计算角度（弧度）并转换为度
data['angle_rad'] = np.arctan2(
    data['vector_nose_left_ear_y'] - data['vec
    data['vector_nose_left_ear_x'] - data['vec
)
data['angle_deg'] = np.degrees(data['angle_rad

# 计算活动距离
data['dx'] = data['sx_individual_0_nose_x'].di
data['dy'] = data['sx_individual_0_nose_y'].di
data['step_distance'] = np.sqrt(data['dx']**2 +
data['cumulative_distance'] = data['step_distan
total_distance = data['step_distance'].sum()
```

Python code



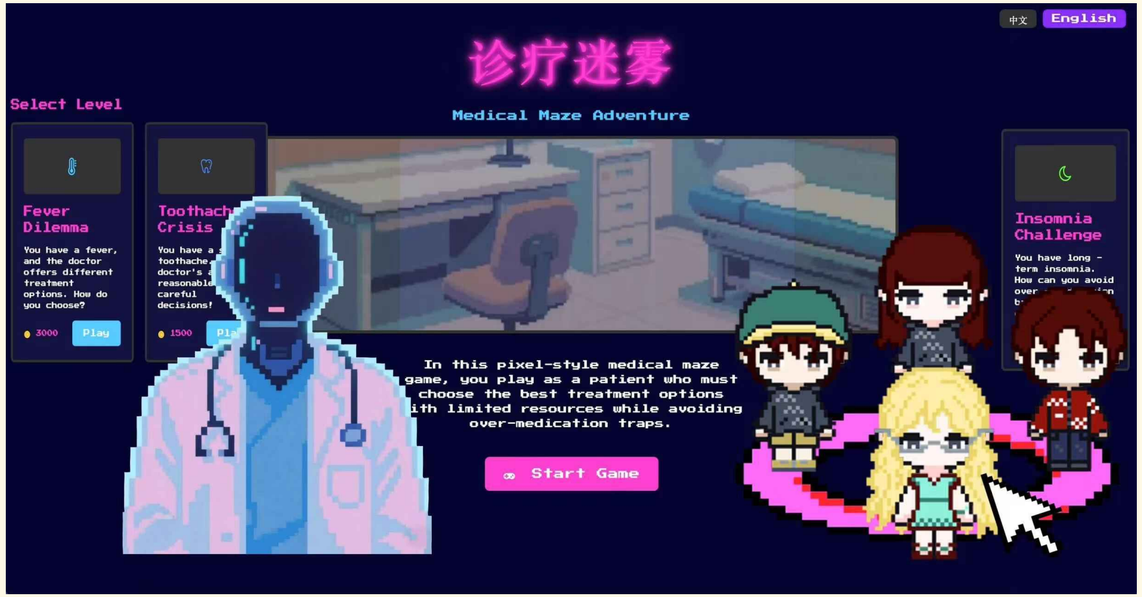
AI-generated quantitative result chart



Project presentation

ACADEMIC RESEARCH

Medical Overuse Analysis & Web Game Design



https://mistymedicalmaze.netlify.app/

```
let titleList = ['发烧难题', '牙痛危机', '失眠挑战']
let titleEnList = ['Fever Dilemma', 'Toothache Crisis', 'Insomn
let maxLevel = 1;
let coinsList = [3000, 1500, 3000]

let bgImgs = []

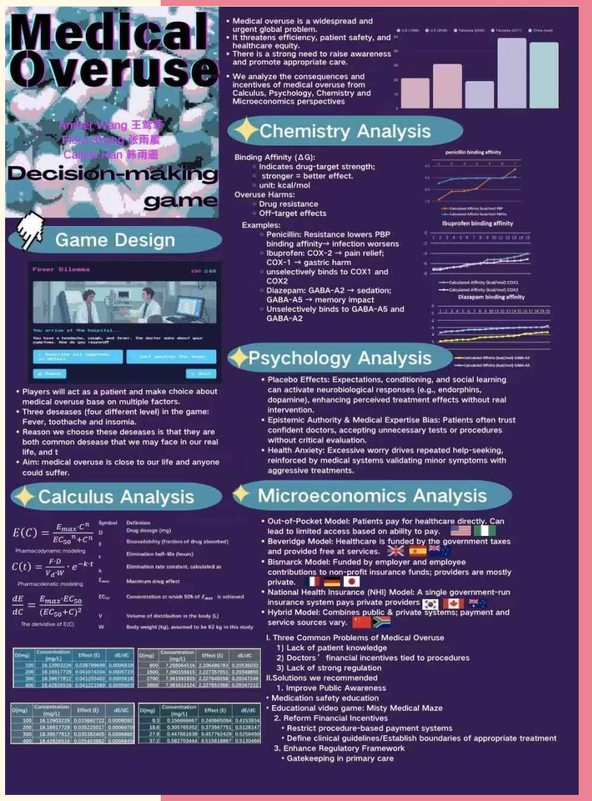
function gamePreload() {
  doctorImgs.push(loadImage("images/doctor1.png"))
  doctorImgs.push(loadImage("images/doctor2.png"))
  bgImgs.push(loadImage("images/1.jpg"));
  bgImgs.push(loadImage("images/2.jpg"));
  bgImgs.push(loadImage("images/3.jpg"));
}

function gameSetup() {
  gameCanvas = createCanvas(840, 256);
  gameCanvas.parent('level-scene');

  for (let i = 0; i < doctorImgs.length; i++) {
    doctorImgs[i].resize(0, height);
```

Working with two teammates, we combined 4 different subjects and wrote a complete research paper. I learned basic web coding on my own to make the game, presented my findings.





Analyzing root causes of medical overuse, I built an interactive web- based game to raise public awareness of unnecessary medical treatment.

“

This project marks my shift from academic writing toward public- oriented outreach.

U.S. Stock Market

A Historical Analysis & Framework for Regime-Adaptive Investing

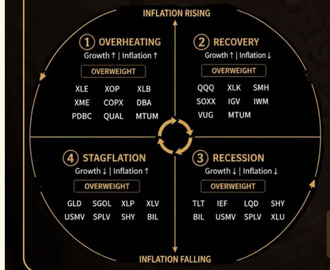
Calista Han

Historical Data Analysis

Six major U.S. bull & bear market

Period	Regime	Event	S&P 500
1921–1929	BULL	Roaring Twenties	+396%
1929–1932	BEAR	Great Depression Deflation	-86%
1982–2000	BULL	Tech-Driven Long Bull Disinflation	+1,263%
2000–2002	BEAR	Dot-Com Bust Tech valuation bubble	-49%
2007–2008	BEAR	Global Financial Crisis Credit leverage unwind	-57%
2009–now	BULL	QE Supercycle Monetary expansion	+1,263%

Regime Identification



Key Indicators

- CPI YoY
- PPI YoY
- Real GDP
- ISM PMI
- Unemployment Rate
- Yield Curve
- Credit Spread
- Financial Conditions Index

Enhanced Merrill Lynch Clock

Asset Ranking

We estimate the probability of each market regime using **Softmax**.

Linear Scoring

For each regime $k \in \{1,\ldots,R\}$:

$$s_{t,k} = w_k^T x_t + b_k$$

x_t: macro feature vector
w_k: weight vector for regime k
b_k: bias term for regime k

Calculates raw match scores between real-time data and each market regime. Raw scores are unbounded and cannot act as probabilities.

Softmax Probability

Convert scores to probabilities:

$$P(k|x_t) = \frac{e^{s_{t,k}}}{\sum_{j=1}^{R} e^{s_{t,j}}}$$

where $\sum_{k=1}^{R} P(k|x_t) = 1$

Converts unbounded scores into standardized probabilities that sum to 1; all regimes retain non-zero likelihood.

Weight asset historical risk-adjusted returns by readable regime probabilities to generate dynamic, allocation rankings.

Investor Psychology

We model the dynamic interaction between Risk-On (R) and Risk-Off (S) investors as a continuous-time system.

Lotka-Volterra Model

$$\frac{dR}{dt} = \alpha R - \beta RS$$
$$\frac{dS}{dt} = \delta RS - \gamma S$$

R: proportion of Risk-On investors
S: proportion of Risk-Off investors
α: natural growth rate of risk-seekers
γ: natural decay rate of fear
β,δ: impact of optimism/fear on each other

Behavioral Biases

- **Loss Aversion**: People feel loss more intensely than gains.
- **Herd Mentality**: Investors blindly follow mainstream market trends.
- **Anchoring Bias**: People rely on old information to judge markets.
- **Sentiment Mean Reversion**: Extreme market optimism or pessimism will fade.

Portfolio Allocation

Combine regime probabilities and investor states to form asset weights.

$$w_{t,k} = \sum_{k=1}^{R} P(k|x_t) \cdot A_{k,t}(R_t, S_t)$$

$w_{i,t}$: weight of asset i at time t
R_t, S_t: investor state from LV model
$A_{i,k}$: target weight of asset i under regime k (adjusted by R_t, S_t)

Programmatic Backtest

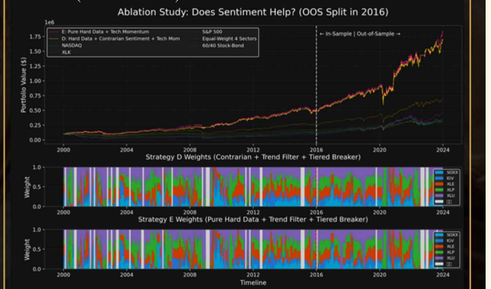
Logical Framework



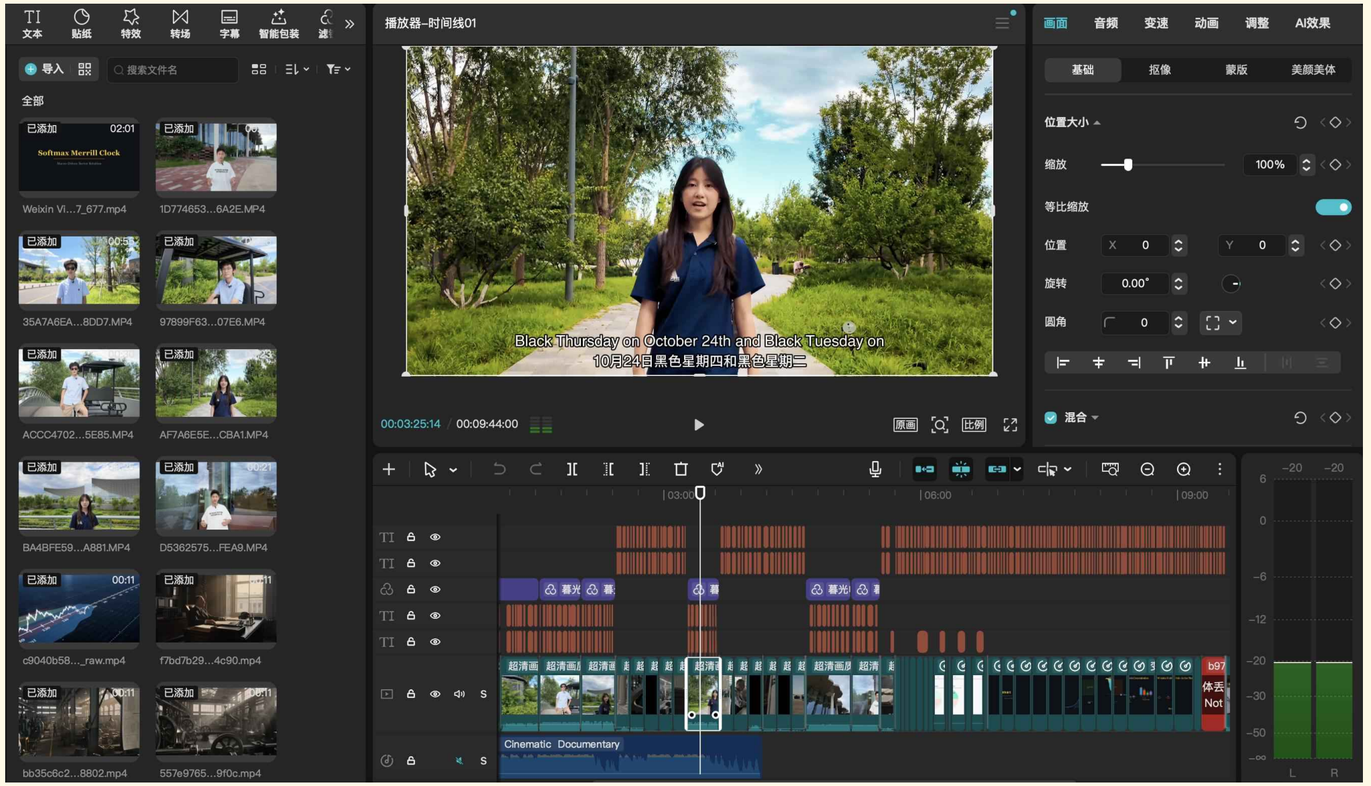
Implementation



Results (2000–2024)



Strategy / Benchmark	In-Sample (2000-2015)			Out-of-Sample Blind Test (2016-2023)		
	Annualized Return	Sharpe Ratio	Max Drawdown	Annualized Return	Sharpe Ratio	Max Drawdown
D: Hard+Soft (Inverse)	10.4%	0.70	-38.8%	16.9%	0.95	-35.3%
E: Pure Hard Data	10.6%	0.68	-37.7%	17.6%	0.97	-35.3%
S&P 500	2.1%	0.21	-56.8%	11.4%	0.67	-33.9%
NASDAQ	1.2%	0.18	-77.9%	15.0%	0.74	-36.4%
Equal-Weight	6.3%	0.43	-46.9%	12.9%	0.77	-37.4%
60/40 Portfolio	3.4%	0.34	-36.6%	8.8%	0.81	-21.3%



U.S. Stock Market Analysis & Strategy Backtesting

I built a regime–adaptive investment framework and backtested ETF performance across historical market cycles. Produced documentary to visualise results.

“

This is where I expanded my inquiry from individual choices to collective crowd behaviour.

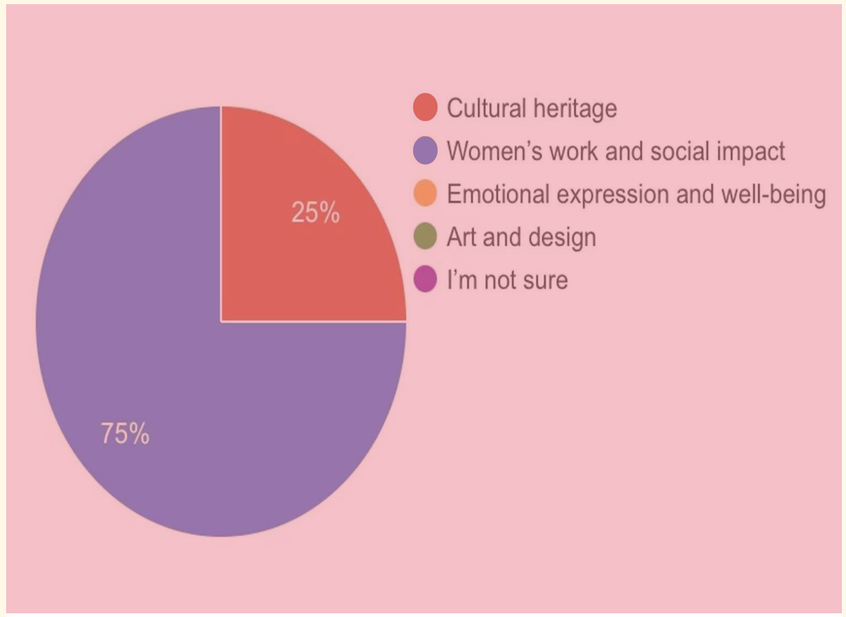
Consumer Preference Inquiry

With 130 responses

I handed out questionnaires alongside introduction cards with distinct thematic framings to people during my UPenn summer program and collected participant responses. I analysed the feedback and visualised the results to compare which narrative resonated most strongly with potential buyers.

> *This project shifted my inquiry from market behaviour to how targeted narratives shape individual consumer choices.*







9/22



CULTURAL HERITAGE

YUYAO HAN

Batik

a Chinese intangible cultural heritage, uses melted beeswax to draw patterns onto plain cloth. Wax repels natural indigo dye, leaving delicate white motifs once the wax is removed.

Crafting one batik piece takes immense patience and long hours, unfolding through a sequence of careful stages, like...



Melting beeswax



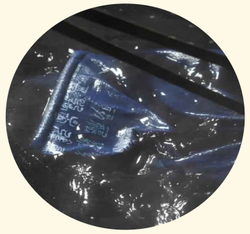
Wax painting close–up



Fermented indigo vat



Cloth dipped in dye

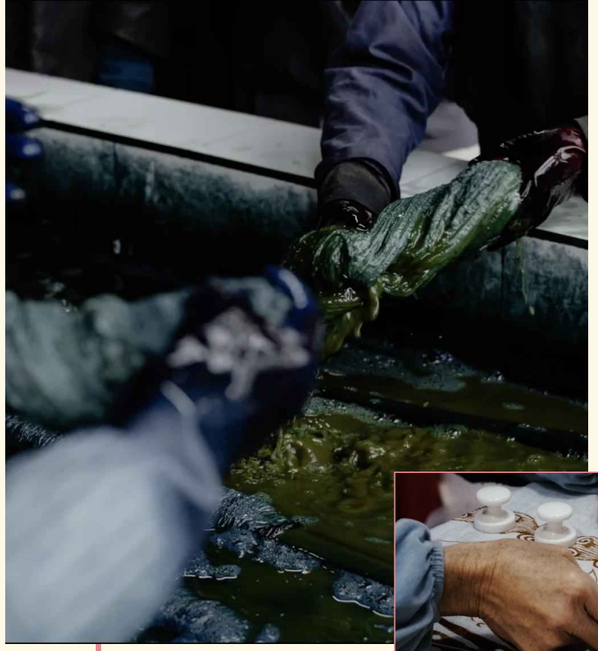


Wax removal process



Air–drying fabric

Introduction of Chinese Batik

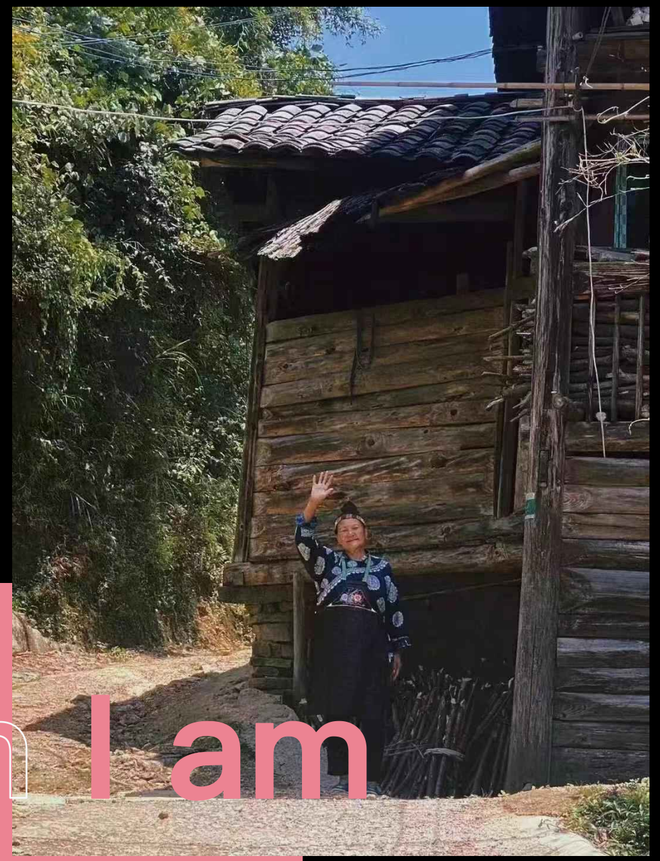








The batik women of Danzhai are Miao and Dong ethnic artisans. Most earn their living through this ancestral craft, passing patterns and memories down through generations.



Whom I am Working with

From Mountain Villages to Beijing



I built connections with these artisans.

It is their lives and stories that give batik its true weight and meaning.

I seek to carry their craft out of mountain villages and into Beijing, so this heritage may take root in the daily lives of young urban people.

Driven by this vision, I founded...

Batik Tales Club



SINCE 2021

SINCE 2021

CULTURAL HERITAGE

I began working on Batik Tales club in middle school. When I graduated, I passed the club to incoming students. I re- established a chapter at my new high school in Beijing to carry forward this cultural mission.









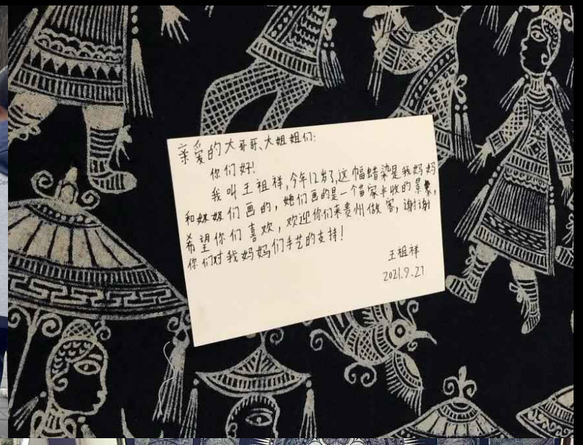
NETWORK

My club members went on to launch 6 independent club chapters in high schools across China and the United States.















Handwritten thank-you notes written by the children of Danzhai batik artisans.

The banner reads: Sales supported by the club brought 10,787 yuan to the artisans.

What We Do

Charity Sales

We host ongoing off-campus charity sales in Sanlitun, in partnership with Yizuo Yiwang, a Guizhou-themed restaurant. This is our club's longest-running regular event, held once every month.

Our hands-on batik workshop invites students to create their own batik pieces and experience the quiet charm of this heritage craft. These sessions do not only teach a skill.

I also reached out independently to external professional counsellors. Using batik as a creative medium, I invited one counsellor to serve as a facilitator for our on-campus Encounter Group.













What We Do

Workshop & Encounter Group


BUSINESS
PRACTICE



Women–Centered Branding

Footwear Startup

This sustainable flip- flop social venture is co- led. A teammate oversees research into eco- friendly materials, while I anchor the project in humanistic values.

I observed how consumer advertising often imposes restrictive roles upon women. Traditional ads cast women either as homemakers, or as pre- homemakers — figures expected to dedicate time to grooming and maintaining a polished appearance. Our product responds to these narrow stereotypes: when wearing these flip- flops, women can simply be themselves.

Project Progress 90%

I plan to carry this footwear social venture forward into my university years.



Business Exchange & Competition Club

Student Coach



I competed as a senior competitor and received a nomination for Best CEO. Afterwards, I became a student coach in my business club to mentor new participants preparing for business pioneer case chanllenge.





I also organize group discussions, where members gather to exchange ideas and debate business strategies.



COMMUNITY IMPACT





AUTISM CHARITY GALA

This event explores how youth-led public gatherings can rally support for marginalized communities. I served as host and oversaw the full program of the charity gala. The event raised 149,126 yuan in donations for autistic communities.





House Captain (Thunderbird)















20 / 22

Student Ambassador





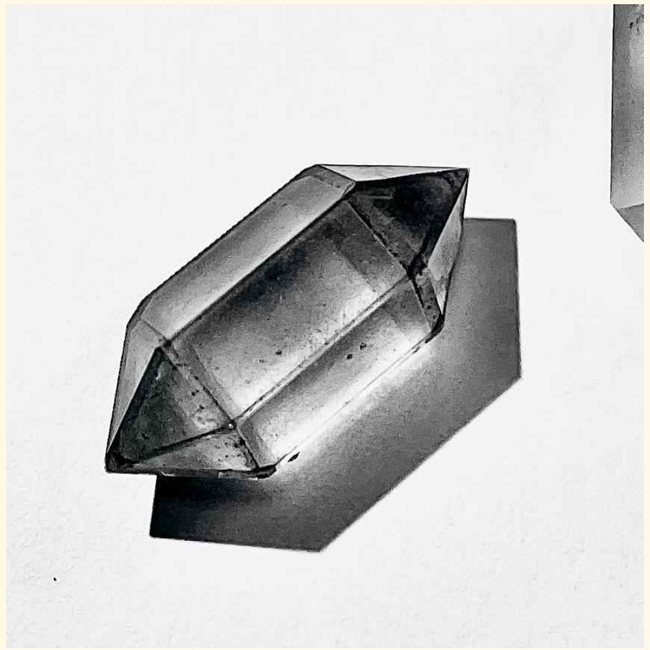






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Portfolio



Portfolio

YUYAO HAN

THANK YOU
for taking the time to follow my exploration

From Guizhou dyers to rural women participants, from lab data to small market trials, what I have pursued is turning technique into human value. This is not a story of one person giving to others. It is an open story, one that anyone may step into.

A participant joining a workshop becomes part of it. A peer debating a research question adds a new layer. A team member iterating a project writes a new chapter.

This story does not belong only to me. Anyone who chooses to build alongside it holds a piece of it. Every misstep, revision and quiet conversation along the way has taught me to hold space for others in the making.