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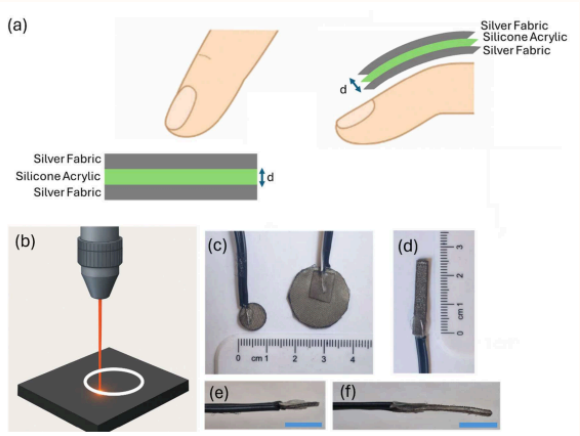
# Research Bulletin

November 2025 Publications

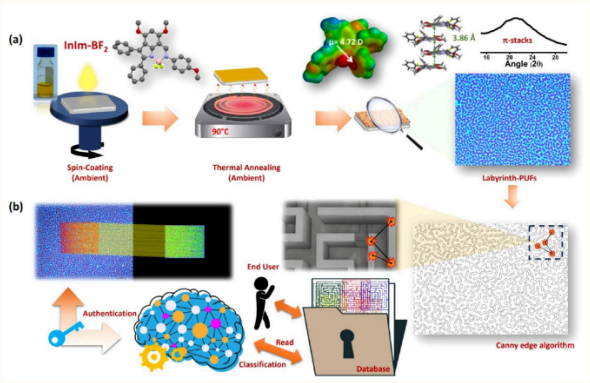
## ULTRA LOW-COST SMART GLOVE DEVELOPED FOR MOTION TRACKING

A wearable glove system for motion detection has been developed by researchers. The sensors, produced using silver-coated fabric and silicone tape, detect finger movements through capacitance changes. With each sensor costing less than $0.05, the system does not require any nanomaterials. Demonstrating high repeatability over 4,000 loading cycles, the glove enables real-time gesture tracking through a Unity-based interface. It offers a scalable platform for rehabilitation, assistive technologies, and interactive systems.




Başıbüyük, Y., Mutluç, M. N., Şavur, Ö., & İçöz, K. (2025). An ultra-low-cost fabric capacitive glove for real-time motion tracking and human–computer interaction. *Engineering Research Express, 7*(4), 045342. https://doi.org/10.1088/2631-8695/ae1794

## UNCLONABLE MOLECULAR TAGS DEVELOPED FOR SECURITY

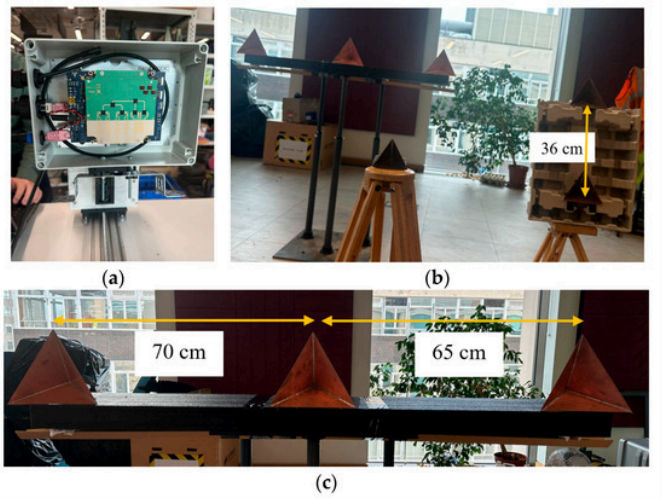



A new boron complex with a high dipole moment has been synthesized. Using a simple two-step production process, unique maze-like microstructures were created. These unclonable physical function (PUF) tags demonstrated high durability in water and temperature tests. The interconnected, intricate structures are well-suited for direct identity verification with high accuracy using deep learning algorithms. This approach is highlighted as offering new potential for anti-counterfeiting measures and advanced cryptographic applications.

Yıldız, T. A., Kiremitler, N. B., Kayacı, N., Kalay, M., Özcan, E., Deneme, I., Coşkun, Z., Onses, M. S., Çoşut, B., & Usta, H. (2025). Labyrinthine microstructures with a high dipole moment boron complex for molecular physically unclonable functions. *ACS Applied Materials and Interfaces, 17*(45), 62685–62696. https://doi.org/10.1021/acsami.5c13228

# A METHOD FOR SIZE REDUCTION AND RESOLUTION ENHANCEMENT IN AUTOMOTIVE RADARS DEVELOPED

To achieve high angular resolution, a 2D MIMO (Multiple Input Multiple Output) array estimation technique based on the Burg algorithm has been proposed. With this approach, both the physical size of the MIMO array and the number of antenna elements can be significantly reduced. This reduction offers cost-effective solutions and improves suitability for applications such as automotive systems, where sensor placement is limited. The performance of the developed method has been validated through both simulation and experimental studies at 77 GHz.




Bekar, M., Bekar, A., Pirkani, A., Baker, C. J., & Gashinova, M. (2025). Burg-aided 2D MIMO array extrapolation for improved spatial resolution. *Sensors, 25*(20), 6310. https://doi.org/10.3390/s25206310

# FRICTION FACTORS IDENTIFIED TO IMPROVE COMFORT IN 3D-PRINTED CLOTHING

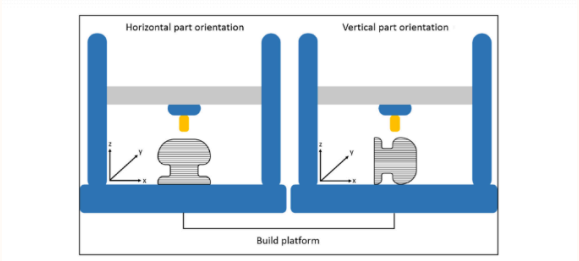



**Figure 2**. Horizontal part orientation (left) and vertical part orientation (right).

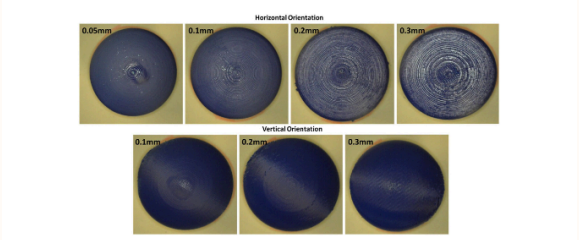


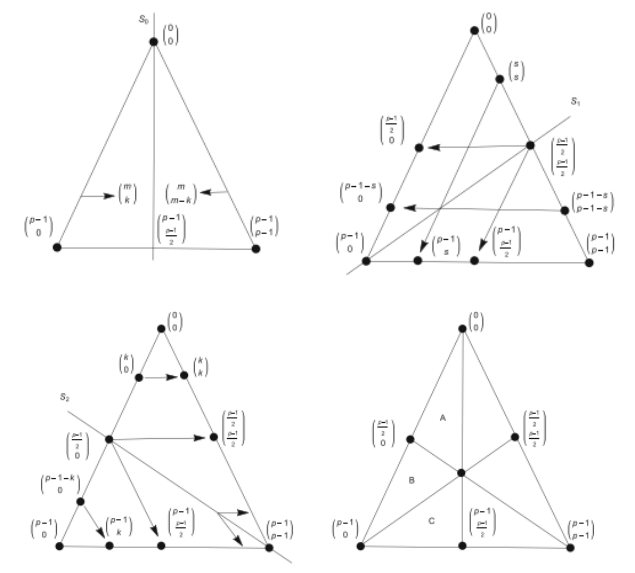

**Figure 3**. High-resolution pictures of ASA specimens manufactured at different layer thicknesses and part orientations using MEX technology.

The friction behavior of wearable products manufactured via 3D printing (additive manufacturing) during skin contact has been investigated to enhance user comfort. Samples were produced using three different fabrication technologies (MEX, VATP, and PBF) and various materials. The results revealed that the coefficient of friction (COF) is significantly influenced by both layer thickness and print orientation. It was determined that higher layer thicknesses consistently result in the highest friction coefficients, regardless of the method or material used. These findings are expected to guide designers of 3D-printed wearable products.

Temel, M., Cicek, U. I., Lloyd, A. B., & Johnson, A. A. (2025). Evaluating the effects of design and manufacturing parameters on friction at the surrogate skin–3D-printed textile interface. *Textile Research Journal*, Article 00405175251380876. https://doi.org/10.1177/00405175251380876

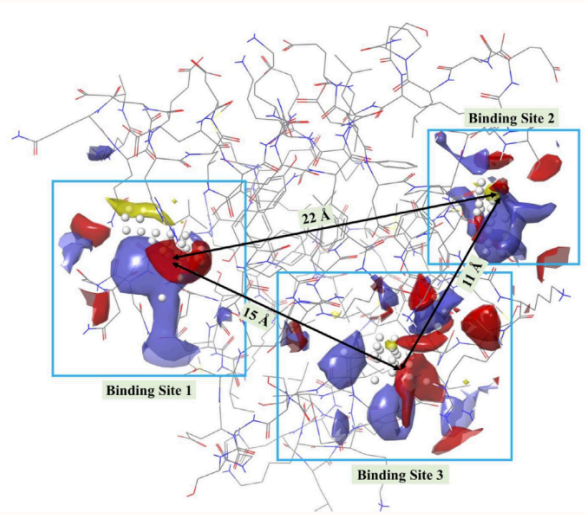
# A NEW AND FAST METHOD DEVELOPED FOR MODULAR COMPUTATION OF BINOMIAL COEFFICIENTS

New congruence criteria similar to Lucas's Theorem have been proposed for computing binomial coefficients modulo a prime number. These criteria resemble the symmetry property of binomial coefficients and offer an extended version of Lucas's Theorem. With the newly developed algorithm, the modular computation of coefficients is accelerated, providing a new method for deriving summation congruences and identities involving binomial coefficients.



Çinkir, Z., & Ozturkalan, A. (2025). An extension of Lucas's theorem. *Indian Journal of Pure and Applied Mathematics*. https://doi.org/10.1007/s13226-025-00881-8

# ANTI-INFLAMMATORY MECHANISM OF THE TRADITIONAL MEDICINAL PLANT INULA VISCOSA DISCOVERED




The interaction of Inula viscosa—a traditional medicinal plant—with the inflammation-related protein Iba1 was investigated. Computational and biological studies predicted that rosmarinic acid and rutin, two major components of the plant, are the strongest binders to Iba1. High doses of Inula viscosa extract were found to significantly reduce Iba1 protein expression and iNOS activity, both associated with inflammation. In addition, the plant was reported to enhance fibroblast migration, indicating potential benefits in supporting wound healing.

Aktas Pepe, N., Acar, B., Ceylan Ekiz, Y., Şenol, A. M., Semiz, G., Sen, A., & Celik-Turgut, G. (2025). Interaction of Inula viscosa (L.) Aiton with Iba1 via rosmarinic acid and rutin: Insights from computational models and biological effects. *ChemistrySelect, 10*(41), e03142. https://doi.org/10.1002/slct.202503142

# A NEW TOOL DEVELOPED TO MEASURE HOLISTIC WELL-BEING

The Holistic Well-Being Measure (HWM), which assesses both hedonic and eudaimonic well-being, has been developed. Using data collected from youth and adults in Türkiye, a 12-item, two-factor structure was validated. The scale demonstrated strong reliability and validity across all age groups. Additionally, the HWM was found to provide unique variance in predicting psychological issues such as depression and anxiety, as well as general health indicators (physical, social, and mental). These results suggest that the tool may contribute to strategies aimed at supporting mental health.

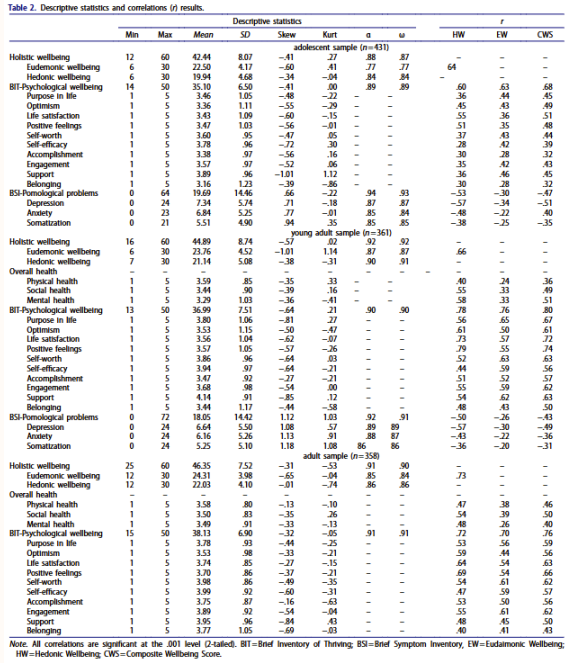


Table 2. Descriptive statistics and correlations (*r*) results.

| | Descriptive statistics | | | | | | | *r* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | *Mean* | *SD* | Skew | Kurt | α | ω | HW | EW | CWS |
| adolescent sample (*n* = 431) | | | | | | | | | | | |
| Holistic wellbeing | 12 | 60 | 42.44 | 8.07 | −.41 | .27 | .88 | .87 | – | – | – |
| Eudemonic wellbeing | 6 | 30 | 22.50 | 4.17 | −.60 | .41 | .77 | .77 | .64 | – | – |
| Hedonic wellbeing | 6 | 30 | 19.94 | 4.68 | −.34 | −.04 | .84 | .84 | – | – | – |
| BIT-Psychological wellbeing | 14 | 50 | 35.10 | 6.50 | −.41 | .00 | .89 | .89 | .60 | .63 | .68 |
| Purpose in life | 1 | 5 | 3.46 | 1.05 | −.48 | −.22 | – | – | .36 | .44 | .45 |
| Optimism | 1 | 5 | 3.36 | 1.11 | −.55 | −.29 | – | – | .45 | .43 | .49 |
| Life satisfaction | 1 | 5 | 3.43 | 1.09 | −.60 | −.15 | – | – | .55 | .36 | .51 |
| Positive feelings | 1 | 5 | 3.47 | 1.03 | −.56 | −.01 | – | – | .51 | .35 | .48 |
| Self-worth | 1 | 5 | 3.60 | .95 | −.47 | .05 | – | – | .37 | .43 | .44 |
| Self-efficacy | 1 | 5 | 3.78 | .96 | −.72 | .30 | – | – | .28 | .42 | .39 |
| Accomplishment | 1 | 5 | 3.38 | .97 | −.56 | .16 | – | – | .30 | .28 | .32 |
| Engagement | 1 | 5 | 3.57 | .97 | −.52 | .06 | – | – | .35 | .42 | .43 |
| Support | 1 | 5 | 3.89 | .96 | −1.01 | 1.12 | – | – | .36 | .46 | .45 |
| Belonging | 1 | 5 | 3.16 | 1.23 | −.39 | −.86 | – | – | .30 | .28 | .32 |
| BSI-Psychological problems | 0 | 64 | 19.69 | 14.46 | .66 | −.22 | .94 | .93 | −.53 | −.30 | −.47 |
| Depression | 0 | 24 | 7.34 | 5.74 | .71 | −.18 | .87 | .87 | −.57 | −.34 | −.51 |
| Anxiety | 0 | 23 | 6.84 | 5.25 | .77 | −.01 | .85 | .84 | −.48 | −.22 | .40 |
| Somatization | 0 | 21 | 5.51 | 4.90 | .94 | .35 | .85 | .85 | −.38 | −.25 | −.35 |
| young adult sample (*n* = 361) | | | | | | | | | | | |
| Holistic wellbeing | 16 | 60 | 44.89 | 8.74 | −.57 | .02 | .92 | .92 | – | – | – |
| Eudemonic wellbeing | 6 | 30 | 23.76 | 4.52 | −1.01 | 1.14 | .87 | .87 | .66 | – | – |
| Hedonic wellbeing | 7 | 30 | 21.14 | 5.08 | −.38 | −.31 | .90 | .91 | – | – | – |
| Overall health | – | – | – | – | – | – | – | – | – | – | – |
| Physical health | 1 | 5 | 3.59 | .85 | −.35 | .33 | – | – | .40 | .24 | .36 |
| Social health | 1 | 5 | 3.44 | .90 | −.39 | .16 | – | – | .55 | .33 | .49 |
| Mental health | 1 | 5 | 3.29 | 1.03 | −.36 | −.41 | – | – | .58 | .33 | .51 |
| BIT-Psychological wellbeing | 13 | 50 | 36.99 | 7.51 | −.64 | .21 | .90 | .90 | .78 | .76 | .80 |
| Purpose in life | 1 | 5 | 3.80 | 1.06 | −.81 | .27 | – | – | .56 | .65 | .67 |
| Optimism | 1 | 5 | 3.53 | 1.15 | −.50 | −.47 | – | – | .61 | .50 | .61 |
| Life satisfaction | 1 | 5 | 3.56 | 1.04 | −.62 | −.07 | – | – | .73 | .57 | .72 |
| Positive feelings | 1 | 5 | 3.57 | 1.05 | −.57 | −.26 | – | – | .79 | .55 | .74 |
| Self-worth | 1 | 5 | 3.86 | .96 | −.64 | .03 | – | – | .52 | .63 | .63 |
| Self-efficacy | 1 | 5 | 3.94 | .97 | −.64 | −.21 | – | – | .44 | .59 | .56 |
| Accomplishment | 1 | 5 | 3.47 | .92 | −.27 | −.21 | – | – | .51 | .52 | .57 |
| Engagement | 1 | 5 | 3.68 | .98 | −.54 | .00 | – | – | .55 | .59 | .62 |
| Support | 1 | 5 | 4.14 | .91 | −.85 | .12 | – | – | .54 | .62 | .63 |
| Belonging | 1 | 5 | 3.44 | 1.17 | −.44 | −.58 | – | – | .48 | .43 | .50 |
| BSI-Pomological problems | 0 | 72 | 18.05 | 14.42 | 1.12 | 1.03 | .92 | .91 | −.50 | −.26 | −.43 |
| Depression | 0 | 24 | 6.64 | 5.50 | 1.08 | .57 | .89 | .89 | −.57 | −.30 | −.49 |
| Anxiety | 0 | 24 | 6.16 | 5.26 | 1.13 | .91 | .88 | .87 | −.43 | −.22 | −.36 |
| Somatization | 0 | 24 | 5.25 | 5.10 | 1.18 | 1.08 | .86 | .86 | −.36 | −.20 | −.31 |
| adult sample (*n* = 358) | | | | | | | | | | | |
| Holistic wellbeing | 25 | 60 | 46.35 | 7.52 | −.31 | −.53 | .91 | .90 | – | – | – |
| Eudemonic wellbeing | 12 | 30 | 24.31 | 3.98 | −.65 | −.04 | .85 | .84 | .73 | – | – |
| Hedonic wellbeing | 12 | 30 | 22.03 | 4.10 | −.01 | −.74 | .86 | .86 | – | – | – |
| Overall health | – | – | – | – | – | – | – | – | – | – | – |
| Physical health | 1 | 5 | 3.58 | .80 | −.13 | −.10 | – | – | .47 | .38 | .46 |
| Social health | 1 | 5 | 3.50 | .83 | −.35 | .26 | – | – | .54 | .39 | .50 |
| Mental health | 1 | 5 | 3.49 | .91 | −.33 | −.13 | – | – | .48 | .26 | .40 |
| BIT-Psychological wellbeing | 15 | 50 | 38.13 | 6.90 | −.32 | −.05 | .91 | .91 | .72 | .70 | .76 |
| Purpose in life | 1 | 5 | 3.78 | .93 | −.44 | −.25 | – | – | .53 | .56 | .59 |
| Optimism | 1 | 5 | 3.53 | .98 | −.33 | −.21 | – | – | .59 | .44 | .56 |
| Life satisfaction | 1 | 5 | 3.74 | .85 | −.27 | −.15 | – | – | .64 | .54 | .63 |
| Positive feelings | 1 | 5 | 3.70 | .86 | −.37 | −.21 | – | – | .69 | .54 | .66 |
| Self-worth | 1 | 5 | 3.98 | .86 | −.49 | −.35 | – | – | .54 | .61 | .62 |
| Self-efficacy | 1 | 5 | 3.99 | .92 | −.60 | −.31 | – | – | .47 | .59 | .57 |
| Accomplishment | 1 | 5 | 3.75 | .87 | −.16 | −.63 | – | – | .53 | .50 | .56 |
| Engagement | 1 | 5 | 3.89 | .92 | −.54 | −.04 | – | – | .55 | .61 | .62 |
| Support | 1 | 5 | 3.95 | .96 | −.84 | .43 | – | – | .48 | .45 | .50 |
| Belonging | 1 | 5 | 3.77 | 1.05 | −.69 | −.03 | – | – | .40 | .41 | .43 |

*Note.* All correlations are significant at the .001 level (2-tailed). BIT = Brief Inventory of Thriving; BSI = Brief Symptom Inventory, EW = Eudaimonic Wellbeing; HW = Hedonic Wellbeing; CWS = Composite Wellbeing Score.


Arslan, G., & Coşkun, M. (2025). Measuring eudaimonic and hedonic wellbeing: Development and validation of the Holistic Wellbeing Measure. *Journal of Personality Assessment*. https://doi.org/10.1080/00223891.2025.2569671

# TANPINAR STUDIES REPOSITIONED IN THE CONTEXT OF GLOBAL LITERATURE

The critical reception of Ahmet Hamdi Tanpınar's works has been examined through a shift from post-Kemalist readings to global interpretations. In the 1980s, Tanpınar was viewed as a central figure for critiques of modernization. Contemporary studies, however, highlight his critique of global modernity and reposition his works within the framework of world literature. The "Global Tanpınar" perspective calls for an approach that situates Türkiye's historical experience within global crises and proposes a cultural policy that transcends dichotomies contributing to global inequalities.

Çelebi, M. C. (2025). The trajectory of 'Tanpınar studies' from post-Kemalism to global Tanpınar. *Turkish Studies*. https://doi.org/10.1080/14683849.2025.2581597

# GENERATING LOST URBAN FABRIC: EXPLORING GENERATIVE ADVERSARIAL NETWORKS AS A TOOL FOR URBAN DESIGN

A study leverages Generative Adversarial Networks to rebuild Hatay, Türkiye's earthquake-hit city center, using pre-disaster maps. It aims to preserve Hatay's architectural identity through Pix2PixHD architecture, blending machine learning with urban design. The research evaluates model performance with quantitative metrics, demonstrating GANs' potential in post-disaster urban design and the impact of dataset scale on generating realistic urban patterns.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