

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau

(43) International Publication Date  
26 January 2023 (26.01.2023)



(10) International Publication Number  
**WO 2023/003595 A1**

(51) International Patent Classification:  
*G06E 1/00* (2006.01)

(21) International Application Number:  
PCT/US2022/013319

(22) International Filing Date:  
21 January 2022 (21.01.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
63/223,491 19 July 2021 (19.07.2021) US  
17/581,113 21 January 2022 (21.01.2022) US

(71) Applicant: SAS INSTITUTE INC. [US/US]; SAS Campus Drive, CARY, North Carolina 27513 (US).

(72) Inventors: **KAKDE, Deovrat Vijay**; 757 McRae Road, CARY, North Carolina 27519 (US). **WANG, Haoyu**; 845 Bristol Bridge Dr., CARY, North Carolina 27519 (US). **MCGUIRK, Anya Mary**; 1212 Happy Hunting Hills Drive, Holly Springs, North Carolina 27540 (US).

(74) Agent: **WOOLARD, Brandee N.**; 1400 Crescent Green, Suite 300, CARY, North Carolina 27518 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW,

(54) Title: QUALITY PREDICTION USING PROCESS DATA

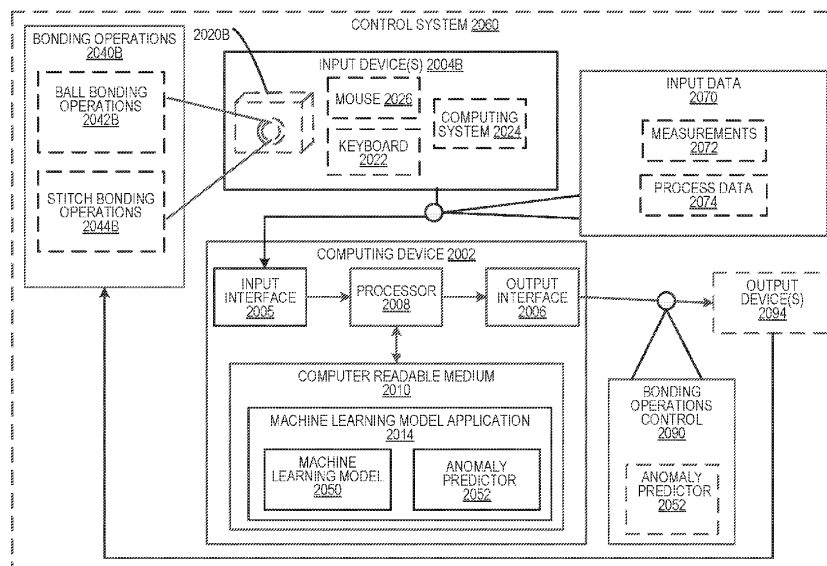


FIG. 20B

(57) Abstract: A computing device (2002) accesses a machine learning model (2050) trained on training data (2032) of first bonding operations (1308, 2040A) (e.g., a ball and/or stitch bond). The first bonding operations comprise operations to bond a first set of wires (1504) to a first set of surfaces (1506, 1508). The machine learning model is trained by supervised learning. The device receives input data (2070) indicating process data (2074) generated from measurements of second bonding operations (2040B). The second bonding operations comprise operations to bond a second set of wires to a second set of surfaces. The device weights the input data according to the machine learning model. The device generates an anomaly predictor (2052) indicating a risk for an anomaly occurrence in the second bonding operations based on weighting the input data according to the machine learning model. The device outputs the anomaly predictor to control the second bonding operations.

[Continued on next page]

WO 2023/003595 A1

SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

**(84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report (Art. 21(3))