

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
07 December 2023 (07.12.2023)



(10) International Publication Number
WO 2023/235308 A1

(51) International Patent Classification:

G06N 3/04 (2023.01) G06N 3/10 (2006.01)
G06N 3/08 (2023.01)

(21) International Application Number:

PCT/US2023/023853

(22) International Filing Date:

30 May 2023 (30.05.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/347,166 31 May 2022 (31.05.2022) US

(71) Applicant: VISA INTERNATIONAL SERVICE
ASSOCIATION [US/US]; P.O. Box 8999, San Francisco,
CA 94128 (US).

(72) Inventors: CHEN, Huiyuan; 919 S Winchester Blvd., San
Jose, CA 95128 (US). LI, Xiaoting; 1120 Kifer Road, Apt.
518, Sunnyvale, CA 94086 (US). PAN, Menghai; 717 W
Julian St., Unit 721, San Jose, CA 95126 (US). YANG, Hao;
2046 Wendover Lane, San Jose, CA 95121 (US). YEH,
Michael; 36012 Burning Tree Dr., Newark, CA 94560 (US).

(74) Agent: PREPELKA, Nathan, J. et al.; The Webb Law
Firm, One Gateway Center, 420 Ft. Duquesne Blvd., Suite
1200, Pittsburgh, PA 15222 (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, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,
MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, 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, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, 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, ME, 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).

(54) Title: METHOD, SYSTEM, AND COMPUTER PROGRAM PRODUCT FOR SIMPLIFYING TRANSFORMER FOR SE-
QUENTIAL RECOMMENDATION

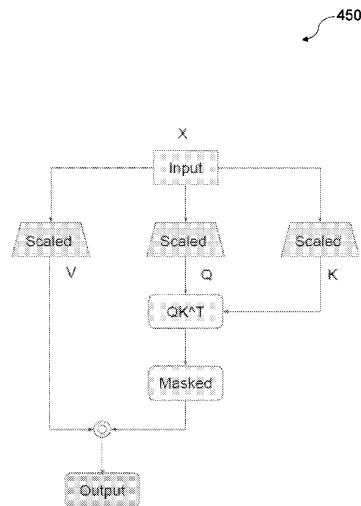


FIG. 4B

(57) Abstract: Methods, systems, and computer program products may simplify Transformer machine learning models for sequential recommendation via a softmax-free gated attention mechanism and/or may use a gated unit to further sparsify attentions, which may simplify attention distributions and reduce negative impacts of noisy items.

[Continued on next page]

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*