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XAVFSIZLIK HODISALARINI TAHLIL QILISH VA XAVFNI BAHOLASH USULLARINING ZAMONAVIY HOLATI

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xavfsizlik hodisalari, xavfni baholash, mashinali o'qitish, AHP, TOPSIS, gibrid model.

Annotatsiya. Tezisda axborot xavfsizligi hodisalarini tahlil qilish va xavfni baholash usullari uch guruhga ajratib ko'rib chiqiladi: ekspert baholariga asoslangan ko'p mezonli usullar (AHP, TOPSIS), mashinali o'qitishga asoslangan usullar va ularning gibrid shakllari. Tanlangan manbalar tahlili shuni ko'rsatadi: ko'p mezonli ishlar asosan nazorat choralari, atributlar va tahdid stsenariylarini baholaydi, mashinali o'qitish ishlari esa hodisani toifalaydi, lekin uning xavf darajasini tashkilot nuqtai nazaridan baholamaydi. Ko'rilgan manbalar ichida shu ikkisini hodisa darajasida birlashtirgan ish topilmadi. Sharh tizimli qidiruv emas, tanlangan manbalar tahliliga asoslanadi..

Kirish

Xavfsizlik monitoringi tizimlari (IDS, SIEM) ko'p miqdorda ogohlantirish hosil qiladi, tahlilchilar ularning hammasini ko'rib chiqa olmaydi. Ndichu va boshq. [1] bu muammoni "alert fatigue" deb ataydi va hosil bo'lgan ogohlantirishlarni saralash, ustuvorlashtirish va bog'lash vazifasini alohida yo'nalish sifatida ko'rib chiqadi. Ular fikricha, faqat jiddiylik darajasiga qarab tartiblash yetarli emas, aktiv ahamiyati va kontekstni hisobga olish kerak.

Hodisalarni ustuvorlashtirish ikki tomondan o'rganilgan. Birinchisi: ekspert fikrini sonli vaznlarga aylantiruvchi ko'p mezonli usullar. Ikkinchisi: hodisalarni mashinali o'qitish yordamida aniqlash va toifalash. Tezisning maqsadi shu ikki yo'nalishdagi tanlangan ishlarni solishtirish va ularni birlashtirishdagi tadqiqot bo'shlig'ini aniqlashdir.

Sharh tizimli qidiruv (PRISMA) emas, ochiq manbalardan tanlangan ishlarga asoslanadi. Shu sabab pastda keltirilgan xulosalar dastlabki hisoblanadi va aniq tizimli qidiruv bilan tasdiqlanishi kerak.

Ekspert baholariga asoslangan usullar

Ko'p mezonli usullar orasida Saati usuli (AHP) eng keng tarqalgani: u juft taqqoslash orqali mezonlar vaznini hisoblaydi va baholar muvofiqligini tekshirishga imkon beradi [2]. Moreira va boshq. [3] AHP yordamida NIST Cybersecurity Framework'ning aniqlash funksiyasidagi nazorat choralarini uch ekspert baholari bilan ustuvorlashtirgan. Taborda Blandón va boshq. [4] AHP bilan xavf tahlili metodologiyasini tanlagan. Wang va boshq. [5] AHP va TOPSIS'ni birlashtirib, aviatsiya tarmoqlari xavfini aktiv qiymati, zaiflikdan foydalanish osonligi, tahdid va himoya choralari bo'yicha baholagan.

Putra va boshq. [6] dengiz kiberxavfsizligida xavfni tahdid, zaiflik va oqibat mezonlari bo'yicha AHP-TOPSIS bilan tahlil qilgan. Ershadi va Forouzandeh [7] axborot xavfsizligi xavfini noravshan FMEA, AHP, Shannon entropiyasi va TOPSIS yordamida baholagan.

Bu ishlarning umumiy xususiyati: baholar ekspertlar fikriga tayanadi, ekspertlar guruhi kichik bo'lishi mumkin (3-5 ekspert [3, 5]), ko'rilgan ishlarda esa hodisalarni avtomatik toifalovchi mashinali o'qitish qismi yo'q.

Mashinali o'qitishga asoslangan usullar

Ali va boshq. [8] ta'kidlashicha, IDS'lar aniqlik, soxta signallar va yangi hujumlarni aniqlashda hamon qiyinchilikka duch keladi, shuning uchun mashinali va chuqur o'qitish algoritmlari qo'llanmoqda. Mohammed va boshq. [9] 2018-2023 yillardagi 393 ta ishni tizimli tahlil qilib, eng ko'p ishlatiladigan usullar sifatida konvolyutsion neyron tarmoqlari, tayanch vektorlar usuli, qaror daraxtlari va genetik algoritmlarni ko'rsatgan. Tripathy va Behera [11] SVM, KNN, qaror daraxti, Random Forest, XGBoost, AdaBoost va ANN'ni KDDCUP'99, NSL-KDD, UNSW-NB15, CICIDS-2017 va CSE-CIC-IDS2018 datasetlarida ko'rib chiqqan.

Sowmya va Mary Anita [10] sun'iy intellektga asoslangan IDS aniqlikni oshirishini, lekin tadqiqotchilar asosan hujumni aniqlash samaradorligiga e'tibor berib, har bir hujum turini alohida toifalashga kamroq e'tibor berganini yozgan.

Muhim cheklov: Ndichu va boshq. [1] CICIDS2017 va shunga o'xshash datasetlar SIEM ogohlantirishlari emas, tarmoq oqimlari ekanini, ularda tahlilchi

qarori bo'yicha yorliqlar yo'qligini qayd etadi. Ustuvorlashtirish uchun tahlilchi yorliqli ochiq dataset hozircha deyarli yo'q, shu sabab ustuvorlashtirish natijalarini bunday datasetlarda to'g'ridan-to'g'ri tekshirish qiyin.

Gibrid yondashuvlar

Mashinali o'qitish va ko'p mezonli usullarni birlashtirgan ishlar bor, lekin ularning maqsadi har xil. Alharbi va boshq. [12] noravshan AHP-TOPSIS yordamida mashinali o'qitishga asoslangan IDS'larning atributlarini baholagan, ya'ni ko'p mezonli usul IDS'ni tanlash va sozlash uchun ishlatilgan, hodisalarni tartiblash uchun emas. Kostiuk va boshq. [13] noravshan mantiq, XGBoost va LSTM'ni noravshan AHP bilan birlashtirib, himoya choralari to'plamini tanlash modelini taklif qilgan va uni SIEM bilan bog'lagan. Mualliflar fikricha, mavjud modellarning ko'pchiligi bashorat, noravshan baholash va himoya choralarini tanlashni alohida masalalar sifatida ko'radi. Ularning natijalari mualliflarning o'zi keltirgan ko'rsatkichlar bo'lib, mustaqil tekshirilmagan.

SOC ogohlantirishlarini ustuvorlashtirish bo'yicha sharhda [1] bu yo'nalishdagi usullar sifatida xavf ballari, kuchaytirib o'qitish, odam fikri bilan o'qitish va kechiktirishni o'rganish ko'rsatilgan. Ekspert vaznlangan ko'p mezonli usullar bu ro'yxatda alohida usul sifatida yo'q.

Tadqiqot bo'shlig'i

Ko'rilgan manbalar asosida uchta bo'shliq ajratildi:

- Ko'p mezonli usullar nazorat choralari [3], metodologiyalar [4], tahdid stsenariylari [5, 6] va IDS atributlarini [12] baholaydi. Mashinali o'qitish bilan toifalangan hodisalarni ekspert vaznlari asosida xavf darajasi bo'yicha tartiblash bu ishlarda uchramadi.
- Ogohlantirishlarni ustuvorlashtirishda asosiy usullar xavf ballari va o'qitishga asoslangan yondashuvlar [1]. Tahlilchi yorliqli ochiq datasetlar yo'qligi [1] sababli ekspert baholariga tayanuvchi mezonlar vaznlarini aniqlash bu o'rinda qo'shimcha imkoniyat bo'lishi mumkin. Bu taxmin, hali tekshirilmagan.
- Gibrid ishlar [13] himoya choralarini tanlashga yo'naltirilgan, hodisa darajasidagi ustuvorlashtirishga emas.

Bu bo'shliqni tasdiqlash uchun PRISMA bo'yicha tizimli qidiruv o'tkazish kerak.

Xulosa

Tanlangan manbalarda ekspert asosidagi ko'p mezonli usullar va mashinali o'qitish alohida rivojlangan, ularni hodisa darajasida birlashtirgan ish ko'rilmadi. Shu sabab mashinali o'qitish bilan hodisalarni toifalash va AHP vaznlari bilan ustuvorlashtirishni birlashtiruvchi gibrid model ishlab chiqish maqsadga muvofiq. Xulosalar dastlabki, ular tizimli qidiruv bilan tekshirilishi kerak.

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