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(54) **Title:** MULTIVARIABLE TIME SEQUENCE PROCESSING METHOD AND APPARATUS, DEVICE AND MEDIUM

(54) 发明名称: 一种多变量时间序列处理方法、装置、设备及介质

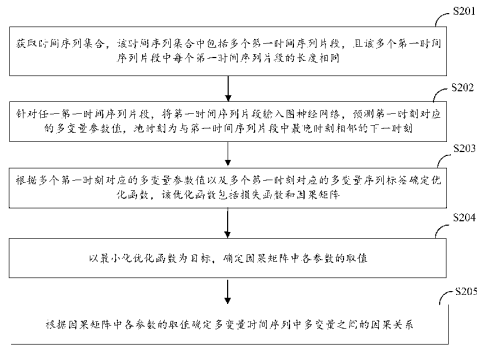


图 2

- S201 Obtain a time sequence set, wherein the time sequence set comprises a plurality of first time sequence fragments, and the length of each of the plurality of first time sequence fragments is the same
- S202 For any first time sequence fragment, input the first time sequence fragment into a graph neural network, and predict a multivariable parameter value corresponding to the first moment, the first moment being the next moment adjacent to the latest moment in the first time sequence fragment
- S203 Determine an optimization function on the basis of multivariable parameter values corresponding to a plurality of first moments and multivariable sequence tags corresponding to the plurality of first moments, the optimization function comprising a loss function and a causal matrix
- S204 Determine a value of each parameter in the causal matrix by taking minimization of the optimization function as a target
- S205 Determine the causal relationship among a plurality of variables in the multivariable time sequence according to the value of each parameter in the causal matrix

(57) **Abstract:** Disclosed in the present application is a multivariable time sequence processing method, comprising: obtaining a time sequence set for mining a causal relationship between variables in a multivariable time sequence, the time sequence set comprising a plurality of first time sequence fragments, wherein each first time sequence fragment has the same length and is a multivariable time sequence; for any first time sequence fragment, inputting the first time sequence fragment into a graph neural network, and predicting a multivariable parameter value corresponding to the first moment, wherein the first moment is the next moment adjacent to the latest moment in the first time sequence fragment; determining an optimization function on the basis of multivariable parameter values corresponding to a plurality of first moments and multivariable sequence tags (true values) corresponding to the plurality of first moments, the optimization function comprising a loss function and a causal matrix of the graph neural network; determining a value of each parameter in the causal matrix by taking minimization of the optimization function as a target; and determining the causal relationship among a plurality of variables according to the value of each parameter.

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NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚
(AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (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)。

本国际公布:

— 包括国际检索报告(条约第21条(3))。

(57) 摘要: 本申请公开了一种多变量时间序列处理方法, 为挖掘多变量时间序列中各变量之间的因果关系, 获取时间序列集合, 该时间序列集合中包括多个第一时间序列片段。其中, 每个第一时间序列片段的长度相同且为多变量时间序列。针对任一第一时间序列片段, 将该第一时间序列片段输入图神经网络, 预测第一时刻对应的多变量参数值。其中, 第一时刻为与所述第一时间序列片段中最晚时刻相邻的下一时刻。基于多个第一时刻对应的多变量参数值以及多个第一时刻对应的多变量序列标签(真实值)确定优化函数, 该优化函数包括图神经网络的损失函数以及因果矩阵。以最小化优化函数为目标确定因果矩阵中各参数的取值, 并根据各参数的取值确定多变量之间的因果关系。