ADVANCES IN INPUT-OUTPUT ANALYSIS pdf

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Input-output analysis, developed by Nobel Prize winner Wassily Leontief, continues to be a vital area of research. Not only do academics find it a powerful tool in understanding how large scale economies--especially national economies--work, but many governments maintain computer input-output models to study their own economies.

Page 81 of a few thousand words, is now possible in software on regular workstations. In terms of recognition performance, word error rates have dropped by more than an order of magnitude in the past decade and are expected to continue to fall with further research. These improvements have come about as a result of technical as well as programmatic innovations. Technically, there have been advances in two areas. First, a paradigm shift from rule-based to model-based methods has taken place. In particular, probabilistic hidden Markov models HMM have proven to be an excellent method of modeling phonemes in various contexts. This model-based paradigm, with its ability to estimate model parameters automatically from training data, has shown its power and versatility by applying the technology to various languages, using the same software. Second, the use of statistical grammars, which estimate the probability of two- and three-word sequences, have been instrumental in improving recognition accuracy, especially for large-vocabulary tasks. These simple statistical grammars have, so far, proven to be superior to traditional rule-based grammars for speech recognition purposes. Programmatically, the collection and dissemination of standard, common training and test corpora worldwide, the sponsorship of common evaluations, and the dissemination at workshops of information about competing methods have all ensured very rapid progress in the technology. This programmatic approach was pioneered by the Defense Advanced Research Projects Agency DARPA , which continues to sponsor common evaluations and initiated the establishment of the Linguistic Data Consortium, which has been in charge of the collection and dissemination of common corpora. A similar approach is now being taken in Europe. Word error rates for speaker-independent continuous speech recognition vary a great deal, depending on the difficulty of the task: Although word error rates in the laboratory can be quite small for some tasks, error rates can increase by a factor of four or more when the same systems are used in the field. This increase has various causes: Speech recognition has begun to enter the mainstream of everyday life, chiefly through telephone-based applications Margulies, The most visible of these applications involve directory assistance services, such as the recognition of a few words e. Current Status and Research Needs. More Than Screen Deep: The National Academies Press. Speaker-independent recognition of over-the-phone digit strings more difficult than single-digit recognition has been deployed since Other less prevalent applications include obtaining stock and mutual fund quotes by voice, simple banking services, and bill payment by telephone. Large-vocabulary dictation systems capable of recognizing discrete speech are available on the market and have been used for years. For continuous speech there are systems that are capable of recognizing a few thousand words in real time; at least one of these systems is now being marketed for the dictation of radiology reports. Systems for using voice for Internet access have recently been announced. Simply making speech recognition available with machines, however, does not necessarily make it immediately useful; it will have to be interfaced properly with the other modalities so that it appears seamless to the user Martin et al. Several vendors have been shipping speech recognition capabilities with personal computers, but there is little evidence of wide usage. Optimism for general use of speech technologies comes from the facts that performance levels are continuing to improve and that many applications do not require large vocabulary sizes. However, applications must be designed to take into account the fact that recognition errors will occur, either by allowing the user to correct errors or by designing additional error correction mechanisms, such as proper inclusion of human-machine dialogue capabilities. These include the ability to deal with issues such as how to phrase a system prompt, how to determine if a recognition error has occurred, and how to engage in conversational repair if such a determination is made. Looking into the future of the national information infrastructure NII , speech recognition could have many applications, such as command and control, information access and retrieval, training and education, e-mail and memo dictation, and voice mail transcription. The current state of the art in speech recognition can support these applications at various levels of performance, some quite well e. The state of the art in that field only allows for the simplest of such applications at this time see "Natural Language Processing" below. Despite significant progress in speech recognition technology in the past decade, the fact remains that machine performance may still not be good enough for many applications. As a barometer of how much progress we may need for certain advanced applications, experiments have shown that human speech recognition performance is still at least an order of magnitude better than that of machines. One optimistic note, however, is that commercialization of the technology is proceeding very vigorously and is lagging the corresponding research capabilities by only a few years, so that any advances in the laboratory can be expected to appear on the market with a delay of only a few years. Speaker Verification A related but quite different technology is speaker verification. There has been much concern about private and secure communications over the Internet, especially for business information and financial transactions. Although encryption methods will be used more and more to protect digital data, it will still be necessary to make a more positive identification of customers for certain types of transactions. Speaker verification technology can be used to help provide additional security. In an initial enrollment phase, each user is enrolled in a system by providing samples of his or her voice. System performance improves over time as the user supplies more voice samples. Using those voice samples, the system creates a model for the voice of each user. Then, when in operation, the system prompts the user to say a random phrase and, using the stored model of the user with the claimed identity, computes the likelihood that the speech came from that person. The user is then either accepted or rejected. The performance of a speaker verification system is often measured by the Equal Error Rate EER , which is the operating point in a system where the false rejection rate is equal to the false acceptance rate. In the laboratory, an EER of less than 0. Performance typically degrades to an EER of 2 to 4 percent in the field. While the current state of the art may be sufficient for low-security applications, it would not, by itself, be adequate for high-security applications. However, if combined with other security measures, such as use of a PIN Personal Identification Number , speaker verification can provide the added desired security for many applications of interest. For users with physical disabilities who would like to have voice-only Page 84 Share Cite Suggested Citation: It should be noted, however, that there are a significant number of people who are unable to speak clearly or reliably. For those people, alternate means of verification will be necessary if they are to use systems that rely on voice verification. Strategies and Accelerators As speech recognition becomes accurate and reliable, it will play a much larger role in future interface systems than it does today. It will not, however, ever completely replace or obsolete keyboard or keypad input to systems. Keying information into systems will continue to be a quiet, accurate, noise-immune and, for some applications, faster means of inputting data or commands. Furthermore, even as the performance of natural language understanding improves, free-form typing of natural language will remain a viable alternative to spoken input to such systems. Today, keypads and keyboards range from systems that are as small as a wristwatch and are operated with a pen tip, to large, wall-sized keyboards operated with a light pen. Common keyboards are operated by using all 10 fingers, which push keys one at a time. Other keyboards have been developed that are chordic in nature and involve the pressing of multiple keys simultaneously. Many of these do not require the user to ever remove his or her hand. In addition to pressing discrete keys, data can also be input using gestures. Finger spelling is one technique. Today, there are gloves that allow the wearer to spell out the desired characters using finger-spelling gestures. Techniques are also being explored that use cameras to take data via both finger spelling and sign language. Handwriting is another common method for entering alpha-numeric data. To increase the rate of data entry, a number of abbreviation and prediction techniques have been developed. Abbreviation techniques allow an individual to use a smaller set of letters which can resemble the target word, such as "abv" for "abbreviation," or be completely arbitrary such as "T1" for "please call home". Prediction techniques look at what a person has typed and try to guess what the next word or words would be. However, for individuals who have to enter data very slowly or for those who have difficulty Page 85 Share Cite Suggested Citation: If a system always guesses consistently e. Ironically, systems that monitor the context and change their guesses to better match the context prevent an individual from getting into the faster abbreviation expansion mode. If systems can predict whole sentences or phrases, however, their utility would increase. This is usually possible only, however, for stereotypic communication Vanderheiden et al. In some aspects this area is one of the more thoroughly researched ones. However, it is not clear what the best techniques are for combining these input techniques for using keyboard input in connection with speech and other virtual reality and gestural input systems. Also, currently there are no good mechanisms for providing keyboard-based input when people are walking or moving about in virtual reality-like environments. Natural Language Processing8 Natural language-spoken, written, or even signed-is at the heart of human communication. It is key to interaction between humans and the medium for much of the vast amount of information stored in books, newspapers, scientific journals, audio and video tapes, and now Web pages. As a means of interaction with computers, it requires no special training on the part of users, but it remains uncommon because of the difficulties in supporting it technically. To date, there have been a number of successful commercial applications of natural language processing, including grammar- and style-checking programs; text indexing and retrieval systems, particularly for the named-entity task9 database query products that utilize natural language as input, which are being marketed for targeted applications; abstracting software for summarizing blocks of text , which has been introduced commercially; and machine-aided translation programs. Access to the NII could be made easier and more productive if people could interact with a computer using natural language and if the computer could better retrieve, summarize, and understand the wealth of linguistic information at its disposal. The challenge of NLP is to build systems that can distinguish in the input language as many significantly different meanings as are relevant to the applications of interest; to interpret correctly as large a variety of linguistic expressions of these meanings as would naturally occur; and to do so in as many task settings as possible, with the computational resources available. Until recently, most NLP systems shared the same gross architecture, roughly analogous to that of programming language compilers: First, after years of working in parallel, researchers in speech recognition and NLP were encouraged to construct integrated speech understanding systems, for which the chosen task was to answer spoken queries to databases e. Second, information extraction was made a major task of interest. Finally, the performance of NLP and speech understanding systems was to be systematically evaluated. It was thus necessary to reject the then-prevailing assumption that the NLP system needed to understand only syntactically and semantically well-formed utterances or that the entire content of an utterance or text needed to be understood. Spoken language systems had to deal with the inevitable recognition errors of even the best speech recognition systems as well as queries such as "Boston San Francisco after 8 a. Even with such difficult input, it now became possible to actually improve the accuracy of even the best speech recognition programs by applying syntactic and semantic constraints, at least in limited domains. Page 87 Share Cite Suggested Citation: The domain specificity of rule-based NLP systems suggests that it would be attractive to be able to automatically train an NLP system, as is done with the hidden Markov models used in speech recognition. Significant effort is being devoted to this direction. The results are promising but still not comparable to what is routinely achievable with rule-based systems. Some of the problems are the amount of training data required, the difficulty of obtaining such data in a wide range of domains, and the cost of annotating the input data with the correct task-specific semantic representation. The annotation problem is exacerbated by the fact that it is much more difficult to get human annotators to agree on correct semantic annotations than on transcriptions of spoken utterances. Many researchers believe that for some time yet the most effective strategy for the development of NLP systems in new domains will be hybrid systems, based on a core of hand-coded rules but tuned to a domain by automatic training methods. Domain-specific corpora can be used, for example, to assign probabilities to the rules, providing a mechanism by which probabilities can be assigned to rule-based interpretations. This approach, used by most of the currently best-performing systems, can be seen as a way of adapting a set of general rules to a particular domain.

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2: EconPapers: Advances in Input-Output Analysis: Technology, Planning, and Development

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Z Imports A more satisfactory way to proceed would be to tie regions together at the industry level. That is, we could identify both intra-region inter-industry transactions and inter-region inter-industry transactions. The problem here is that the table grows quickly. Inputâ€"output is conceptually simple. Its extension to a model of equilibrium in the national economy has been done successfully using high-quality data. One who wishes to do work with inputâ€"output systems must deal skillfully with industry classification, data estimation, and inverting very large, ill-conditioned matrices. Moreover, changes in relative prices are not readily handled by this modeling approach alone. Of course, inputâ€"output accounts are part and parcel to a more flexible form of modeling, Computable general equilibrium models. Two additional difficulties are of interest in transportation work. There is the question of substituting one input for another, and there is the question about the stability of coefficients as production increases or decreases. These are intertwined questions. They have to do with the nature of regional production functions. Usefulness[edit] Because the inputâ€"output model is fundamentally linear in nature, it lends itself to rapid computation as well as flexibility in computing the effects of changes in demand. Inputâ€"output models for different regions can also be linked together to investigate the effects of inter-regional trade, and additional columns can be added to the table to perform environmentally extended input-output analysis EEIOA. For example, information on fossil fuel inputs to each sector can be used to investigate flows of embodied carbon within and between different economies. The structure of the inputâ€"output model has been incorporated into national accounting in many developed countries, and as such can be used to calculate important measures such as national GDP. Inputâ€"output economics has been used to study regional economies within a nation, and as a tool for national and regional economic planning. It is also used to identify economically related industry clusters and also so-called "key" or "target" industries industries that are most likely to enhance the internal coherence of a specified economy. By linking industrial output to satellite accounts articulating energy use, effluent production, space needs, and so on, inputâ€"output analysts have extended the approaches application to a wide variety of uses. Input-output and socialist planning[edit] The input-output model is one of the major conceptual models for a socialist planned economy. This model involves the direct determination of physical quantities to be produced in each industry, which is used to formulate a consistent economic plan of resource allocation. This method of planning is contrasted with price-directed Lange-model socialism and Soviet-style material balance planning. Input-output planning was never adopted because the material balance system had become entrenched in the Soviet economy, and input-output planning was shunned for ideological reasons. As a result, the benefits of consistent and detailed planning through input-output analysis was never realized in the Soviet-type economies. Because the data collection and preparation process for the inputâ€"output accounts is necessarily labor and computer intensive, inputâ€"output tables are often published long after the year in which the data were collectedâ€"typically as much as 5â€"7 years after. However, many developed countries estimate inputâ€"output accounts annually and with much greater recency. This is because while most uses of the inputâ€"output analysis focus on the matrix set of inter-industry exchanges, the actual focus of the analysis from the perspective of most national statistical agencies is the benchmarking of gross domestic product. Inputâ€"output tables therefore are an instrumental part of national accounts. As suggested above, the core inputâ€"output table reports only intermediate goods and services that are exchanged among industries. But an array of row vectors , typically aligned at the bottom of this matrix, record non-industrial inputs by industry like payments for labor; indirect business taxes; dividends, interest, and rents; capital consumption allowances depreciation ; other property-type income like profits ; and purchases from foreign suppliers imports. At a national level, although excluding the imports, when summed this is called "gross product originating" or "gross domestic product by industry. See also Gross domestic product. Inputâ€"output analysis versus consistency analysis[edit] Despite the clear ability of the input-output model to depict and analyze the dependence of one industry or sector on another, Leontief and others never managed to introduce the full spectrum of dependency relations in a market economy. Consistency analysis explores the consistency of plans of buyers and sellers by decomposing the inputâ€”output table into four matrices, each for a different kind of means of payment. It integrates micro and macroeconomics into one model and deals with money in a value-free manner. It deals with the flow of funds via the movement of goods.

3: Inputâ€“output model - Wikipedia

Bibliography Includes bibliographical references and index. Publisher's Summary Input-Output economic analysis, developed by Wassily Leontief, for which he won the Nobel Prize, continues to be an active area of research.

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This publication of selected papers from the input-ouput conference offers and excellent opportunity to briefly review the growth of input-output analysis from its childhood to its maturity and thus to trace the important phases and trends in its development.

7: Advances in Input-Output Analysis - William Peterson - Oxford University Press

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8: Karen R. Polenske - Wikipedia

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