

# EVOLUTION OF MACHINE TRANSLATION SYSTEMS OVER THE YEARS

Classical approach based  
Machine translation

Rule Based Machine  
Translation (RBMT)

1950

Direct Machine  
Translation

Interlingua Based  
Machine  
Translation

Transfer Based  
Machine  
Translation

Statistical based  
Machine Translation

Example Based  
Machine Translation  
(EBMT)

1980

Statistical Based  
Machine Translation  
(SMT)

1990

Phrase Based  
Machine  
Translation

Syntax Based  
Machine  
Translation

Hierarchical  
Based Machine  
Translation

Deep learning approach  
based Machine  
Translation

Neural Machine  
Translation (NMT)

2014

Attention Based  
Machine  
Translation

Transformers

# Machine Translation Systems

**Sin-wai Chan**



## **Machine Translation Systems:**

**Machine Translation Systems** Jonathan Slocum, 1988      **Machine Translation** John Lehrberger, 1988 The use of the computer in translating natural languages ranges from that of a translator's aid for word processing and dictionary lookup to that of a full fledged translator on its own. However the obstacles to translating by means of the computer are primarily linguistic. To overcome them it is necessary to resolve the ambiguities that pervade a natural language when words and sentences are viewed in isolation. The problem then is to formalize in the computer these aspects of natural language understanding. The authors show how from a linguistic point of view one may form some idea of what goes on inside a system's black box given only the input original text and the raw output translated text before post editing. Many examples of English French translation are used to illustrate the principles involved.

**Computers and Translation** Harold Somers, 2003-05-28 This volume is about computers and translation. It is not however a Computer Science book nor does it have much to say about Translation Theory. Rather it is a book for translators and other professional linguists, technical writers, bilingual secretaries, language teachers, even which aims at clarifying, explaining and exemplifying the impact that computers have had and are having on their profession. It is about Machine Translation (MT) but it is also about Computer Aided or Assisted Translation (CAT), computer based resources for translators, the past, present and future of translation and the computer. The editor and main contributor Harold Somers is Professor of Language Engineering at UMIST Manchester. With over 25 years experience in the field both as a researcher and educator, Somers is editor of one of the field's premier journals and has written extensively on the subject including the field's most widely quoted textbook on MT, now out of print and somewhat out of date. The current volume aims to provide an accessible yet not overwhelmingly technical book aimed primarily at translators and other users of CAT software.

**Machine Translation Summit** Makoto Nagao, Hozumi Tanaka, 1989

**Machine Translation Systems** Jonathan Slocum, 1988      Automatic Improvement of Machine Translation Systems Ariadna Font Llitjós, 2007 Abstract Achieving high translation quality remains the most daunting challenge. Machine Translation (MT) systems currently face. Researchers have explored a variety of methods for including translator feedback in the MT loop. However most MT systems have failed to incorporate post editing efforts beyond the addition of corrected translations to the parallel training data. For Example Based and Statistical systems or to a translation memory database. This thesis describes a novel approach that utilizes post editing information to automatically improve the underlying rules and lexical entries of a Transfer Based MT system. This process can be divided into two main steps. First an online translation correction tool allows for easy error diagnosis and implicit error categorization. Then an Automatic Rule Refiner performs error remediation by tracing errors back to the problematic rules and lexical entries and executing repairs that are mostly lexical and morpho syntactic in nature such as word order, missing constituents or incorrect agreement in transfer rules. This approach directly improves the intelligibility of corrected MT output and more significantly it generalizes over unseen data.

providing improved MT output for similar sentences that have not been corrected Experimental results on an English Spanish MT system show that automatic rule refinements triggered by bilingual speaker corrections successfully translate unseen data that was incorrectly translated by the original unrefined grammar Improvements on translation quality over a baseline as measured by standard automatic evaluation metrics are statistically significant on a paired two tailed t test  $p < 0.005$  One practical application of this research is extending and refining relatively small translation grammars for resource poor languages such as Mapudungun and Quechua into a major language such as English or Spanish Initial experimental results on a Spanish Mapudungun MT system show that rule refinement operations generalize well to a different language pair and are able to correct errors in the grammar and the lexicon

**Neural Machine Translation** Philipp Koehn, 2020-06-18 Deep learning is revolutionizing how machine translation systems are built today This book introduces the challenge of machine translation and evaluation including historical linguistic and applied context then develops the core deep learning methods used for natural language applications Code examples in Python give readers a hands on blueprint for understanding and implementing their own machine translation systems The book also provides extensive coverage of machine learning tricks issues involved in handling various forms of data model enhancements and current challenges and methods for analysis and visualization Summaries of the current research in the field make this a state of the art textbook for undergraduate and graduate classes as well as an essential reference for researchers and developers interested in other applications of neural methods in the broader field of human language processing

**Computers in Translation** John Newton, 2002-09-11 Researchers have been attempting to develop systems that would emulate the human translation process for some forty years What is it about human language that makes this such a daunting challenge While other software packages have achieved rapid and lasting success machine translation has failed to penetrate the worldwide market to any appreciable extent Does this merely reflect a reluctance to adopt it or does it signal a more fundamental and intractable problem Computers in Translation is a comprehensive guide to the practical issues surrounding machine translation and computer based translation tools Translators system designers system operators and researchers present the facts about machine translation its history its successes its limitations and its potential Three chapters deal with actual machine translation applications discussing installations including the METEO system used in Canada to translate weather forecasts and weather reports and the system used in the Foreign Technology Division of the US Air Force

*The Human Factor in Machine Translation* Sin-wai Chan, 2018-05-08 Machine translation has become increasingly popular especially with the introduction of neural machine translation in major online translation systems However despite the rapid advances in machine translation the role of a human translator remains crucial As illustrated by the chapters in this book man machine interaction is essential in machine translation localisation terminology management and crowdsourcing translation In fact the importance of a human translator before during and after machine processing cannot be overemphasised as human intervention is the best way to ensure the

translation quality of machine translation This volume explores the role of a human translator in machine translation from various perspectives affording a comprehensive look at this topical research area This book is essential reading for anyone involved in translation studies machine translation or interested in translation technology Hybrid Approaches to Machine Translation Marta R. Costa-jussà, Reinhard Rapp, Patrik Lambert, Kurt Eberle, Rafael E. Banchs, Bogdan Babych, 2016-07-12 This volume provides an overview of the field of Hybrid Machine Translation MT and presents some of the latest research conducted by linguists and practitioners from different multidisciplinary areas Nowadays most important developments in MT are achieved by combining data driven and rule based techniques These combinations typically involve hybridization of different traditional paradigms such as the introduction of linguistic knowledge into statistical approaches to MT the incorporation of data driven components into rule based approaches or statistical and rule based pre and post processing for both types of MT architectures The book is of interest primarily to MT specialists but also in the wider fields of Computational Linguistics Machine Learning and Data Mining to translators and managers of translation companies and departments who are interested in recent developments concerning automated translation tools Machine translation for everyone: Empowering users in the age of artificial intelligence Dorothy Kenny , 2022-07-06 Language learning and translation have always been complementary pillars of multilingualism in the European Union Both have been affected by the increasing availability of machine translation MT language learners now make use of free online MT to help them both understand and produce texts in a second language but there are fears that uninformed use of the technology could undermine effective language learning At the same time MT is promoted as a technology that will change the face of professional translation but the technical opacity of contemporary approaches and the legal and ethical issues they raise can make the participation of human translators in contemporary MT workflows particularly complicated Against this background this book attempts to promote teaching and learning about MT among a broad range of readers including language learners language teachers trainee translators translation teachers and professional translators It presents a rationale for learning about MT and provides both a basic introduction to contemporary machine learning based MT and a more advanced discussion of neural MT It explores the ethical issues that increased use of MT raises and provides advice on its application in language learning It also shows how users can make the most of MT through pre editing post editing and customization of the technology **Machine Translation and Global Research** Lynne Bowker, Jairo Buitrago Ciro, 2019-05-01 Lynne Bowker and Jairo Buitrago Ciro introduce the concept of machine translation literacy a new kind of literacy for scholars and librarians in the digital age This book is a must read for researchers and information professionals eager to maximize the global reach and impact of any form of scholarly work **Status of Machine Translation (MT) Technology** United States. Congress. House. Committee on Science, Space, and Technology. Subcommittee on Science, Research, and Technology, 1990 Evaluation of Machine Translation Systems M. Saiz, J. McNaught, Language and

Linguistics,1994      **Lecture Notes in Real-Time Intelligent Systems** Jolanta Mizera-Pietraszko,Pit

Pichappan,2017-08-07 Intelligent computing refers greatly to artificial intelligence with the aim at making computer to act as a human This newly developed area of real time intelligent computing integrates the aspect of dynamic environments with the human intelligence This book presents a comprehensive practical and easy to read account which describes current state of the art in designing and implementing real time intelligent computing to robotics alert systems IoT remote access control multi agent systems networking mobile smart systems crowd sourcing broadband systems cloud computing streaming data and many other applications areas The solutions discussed in this book will encourage the researchers and IT professional to put the methods into their practice      **UNITRAN** Bonnie J. Dorr,MASSACHUSETTS INST OF TECH CAMBRIDGE

ARTIFICIAL INTELLIGENCE LAB.,Massachusetts Institute of Technology. Artificial Intelligence Laboratory,1987 Machine translation has been a particularly difficult problem in the area of Natural Language Processing for over two decades Early approaches to translation failed partly because interaction effects of complex phenomena made translation appear to be unmanageable Later approaches to the problem have been more successful but are based on many language specific rules of a context free nature To try to capture all of the phenomena allowed in natural languages context free rule based systems require an overwhelming number of rules thus such translation systems either have limited linguistic coverage or they have poor performance due to formidable grammar size This report presents an implementation of an alternative approach to natural language translation The UNITRAN Universal Translator system relies on principle based descriptions of grammar rather than rule oriented descriptions The approach taken is interlingual i e the model is based on universal principles that hold across all languages the distinctions among languages are then handled by settings of parameters associated with the universal principles The grammar is viewed as a modular system of principles rather than a large set of ad hoc language specific rules Interaction effects of linguistic principles are handled by the system so that the programmer does not need to specifically spell out the details of rule applications Only a small set of principles covers all languages thus the unmanageable grammar size of alternative approaches is no longer a problem      Recent Advances in Example-Based Machine Translation

M. Carl,Andy Way,2012-12-06 Recent Advances in Example Based Machine Translation is of relevance to researchers and program developers in the field of Machine Translation and especially Example Based Machine Translation bilingual text processing and cross linguistic information retrieval It is also of interest to translation technologists and localisation professionals Recent Advances in Example Based Machine Translation fills a void because it is the first book to tackle the issue of EBMT in depth It gives a state of the art overview of EBMT techniques and provides a coherent structure in which all aspects of EBMT are embedded Its contributions are written by long standing researchers in the field of MT in general and EBMT in particular This book can be used in graduate level courses in machine translation and statistical NLP

**Chinese-English Machine Translation System** University of California, Berkeley. Department of Linguistics,William

S.-Y. Wang,1976 The report documents results of a 2 year R and D effort directed at the completion of a prototype system for Chinese English machine translation of literature The system designated QUINCE accepts Chinese input exactly as printed with no pre editing of any kind and produces English output on experimental basis Coding of Chinese text via Chinese teleprinter System Model 600D and subsequent conversion to Standard Telegraphic Code for a direct input to the computer have been successfully completed Manual keypunching and coding have been completely eliminated Speech-to-Speech Translation Hiroaki Kitano,2012-12-06 Speech to Speech Translation a Massively Parallel Memory Based Approach describes one of the world s first successful speech to speech machine translation systems This system accepts speaker independent continuous speech and produces translations as audio output Subsequent versions of this machine translation system have been implemented on several massively parallel computers and these systems have attained translation performance in the milliseconds range The success of this project triggered several massively parallel projects as well as other massively parallel artificial intelligence projects throughout the world Dr Hiroaki Kitano received the distinguished Computers and Thought Award from the International Joint Conferences on Artificial Intelligence in 1993 for his work in this area and that work is reported in this book The Development and Use of Machine Translation Systems and Computer-based Translation Tools William John Hutchins,2003

## Decoding **Machine Translation Systems**: Revealing the Captivating Potential of Verbal Expression

In a time characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its power to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Machine Translation Systems**," a mesmerizing literary creation penned with a celebrated wordsmith, readers embark on an enlightening odyssey, unraveling the intricate significance of language and its enduring affect our lives. In this appraisal, we shall explore the book's central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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